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ART. XIV.—ADDRESS DELIVERED TO THE GRADUATES OF THE PHILADELPHIA COLLEGE OF PHARMACY, April 23d 1839. By Joseph Carson, M. D. Prof. of Mat. Med. and Pharmacy.

Gentlemen:

To comply with an established custom, I present myself before you upon the present occasion, having been appointed the organ of the Institution, in which have been pursued the studies requisite to qualify you for the exercise of your profession. In addressing you, however, it would be impossible to divest myself of the feelings and sympathies which have arisen from the relation hitherto existing between us, a relation originating in the part I have taken in the direction of your studies. Still retaining, therefore, the recollection of the office as your teacher, through which I have been intimately associated with you, I conceive that I am acting in a two-fold capacity, and that while my claims upon your attention are strengthened, I am impelled, by an additional motive, to execute faithfully the last official duty in which you are interested.

From the evidence adduced upon examination before the constituted authority, your acquirements in the branches of science taught in the College of Pharmacy, and the proficiency you have attained in the pharmaceutic art, have been deemed sufficient to entitle you to the honors of graduation, the reward

merited by your assiduity and careful preparation to deserve them. My first impulse is, to congratulate you upon the happy fulfilment of the laudable aspirations by which you have been actuated, in pursuing your probationary course, and in so doing, I may assert, I have the heartfelt concurrence of my coadjutor and the members of the College. But it would be an abuse of the trust confided to me, did I indulge in extended complimentary remarks upon the attention given to preliminary qualifications; much worthier are the purposes designed by my appointment; and with the desire of fulfilling them, I shall take advantage of the opportunity, to impress upon you correct views of the profession you have chosen, to indicate the objects you should strive to attain, the means you should employ, and the motives by which you should be governed. These will be the topics of the discourse to be delivered.

The profession of Pharmacy is one of those having for their object the good of mankind; it is inseparably connected with the general welfare. To appreciate its importance, it is only needful to look back through the vista of time, and recognise its existence from the earliest date. The benefits derived from it have been admitted to be of the highest consequence, and public opinion has at every period been kindly affected towards it, as evinced by the estimation in which it has been and continues to be held. Nor from the duties it imposes, could the regard conferred be more richly deserved by any other employment; like the profession of medicine, of which it is the handmaid, it has been called into operation by necessity, and owes its origin to the frailties, the infirmities, the perishable condition of the human family. It affords resources against pain, disease, and death, and has a powerful influence over the passions and the affections of man, as it is capable of exciting his hopes, allaying his fears, and ministering to his comforts and wants.

Were we merely indebted to Pharmacy for the means of mitigating the ills of life, it would be sufficient to call forth expressions of merited commendation. But there is another point of view under which it is to be considered, which is, the

agency it has exercised in promoting the advancement of our race, by communicating a power over external circumstances, through efficient instruments, which have been successfully employed with this effect. In attributing to Pharmacy the credit of bestowing innumerable advantages which are now possessed, it must be regarded as a comprehensive science, embodying a number of subsidiary departments, each of which has a separate sphere of usefulness. However independent they may appear of a parent stock, it should be borne in mind, that they were originally the offspring of pharmaceutic investigation, and in their infancy were sustained by the fostering care and nourishment which this afforded. The objects that first excited attention, were the articles composing, or likely to contribute to the materia medica; the researches instituted were such as would lead to a more extensive acquaintance with their nature, peculiarities, mutual relations, and uses. The first naturalists and natural philosophers were pharmaceutists, who entered upon an exploration of the material world, solely with the desire to add to their facilities of practice. With so extensive a field, it could not be otherwise than that an abundant harvest of discovery should reward the labor of observation and experiment, and that knowledge, general as well as particular in its application, should be elicited; to this is to be traced the birth of Chemistry, Botany, Zoology, Mineralogy, and Natural Philosophy, the branches of which Pharmacy is composed. It is not essential to enter into the details, by an exposition of which it could be shown, that these sciences have been of indispensable service in promoting the arts, whereby the lowest member of a civilized and refined community is incomparably superior to the savage—they are known to every one who is the least conversant with the subject: Agriculture, Manufactures, Commerce, and even Literature, have been more or less indebted to them. Surely, then, it is not an assumption to assert, that Pharmacy has performed a conspicuous part in working a favorable change upon the physical as well as moral condition of mankind, in revolutionizing the aspect of the social state. Hence it is entitled to a larger proportion of respect and gratitude.

But Pharmacy is yet more fortunate; for while it should be cherished, on account of its direct utility, it furnishes subjects for contemplation, that can attract, elevate, and improve the mind. Let me present the grounds of this opinion. The sciences enumerated are devoted to the scrutiny of Nature, implying an examination of her productions,and the determination of the forces every where operative in the origination of phenomena. How ample the range it offers! Take either Botany, Zoology, or Miralogy, and its objects are not confined to place or country; there is no restriction to its inquiries, except that which the limits of the earth impose; for in every region the most valuable treasures have been detected. How diversified the structure, forms, and properties exhibited! Pass in review these several departments, and it will be manifest that each comprises a multitude of individual existences, dissimilar in construction, appearance, and inherent qualities. What order prevails among these beings! With what regularity are their parts conjoined, and with what subserviency of purpose are they fitted to one another! Examine an animal, a plant, or a crystal, and nothing can be detected at variance with an universal principle of harmony.

Extended as may be the sources whence bodies are derived, whether organic or inorganic, infinite as may be their forms, complex as may be their parts, and various as are their qualities, still investigation is not satisfied; Chemistry submits them to its operations, their composition is determined, and such as are compound are resolved into their simple elements; the laws that govern particles and masses, that regulate their movements, are expounded; the numerous processes through which matter must pass in the assumption of new shapes are developed, while the agents are indicated that serve to effect such modifications. From data thus supplied, the plan on which our globe is formed can be elucidated; Eternal wisdom and design can be made evident. Now, I would ask, if such be the nature of the pursuits embraced by Pharmacy, if such the tendencies of which they are susceptible, when carried to their full extent, where can there be found others

possessed of greater fascination? By which among the many classes of human learning, can higher tone of intellect be given?

Again, while thus expressing our views of the nature and tendencies of the pursuits connected with Pharmacy, let us observe the influence they are capable of exerting upon the mental faculties. The facts that constitute the knowledge necessary to be acquired, are not seen through the dim medium of conjecture, but have been revealed and made conspicuous from close, accurate, and reiterated inspection; they are based upon the strictest evidence. Neither are they promiscuously commingled: for they have been so arranged and systematized, as to render their perpetuity indubitable, and their attainment easy. For these reasons, this knowledge is entitled to the name of *positive*. It regards demonstration as indispensable to establish propositions, and admits no conclusions to be sound but such as have been arrived at by rigid induction. To avoid the causes of deceit, the perception must be aroused, the reasoning powers invigorated, and such mental training is enforced, as to be productive of lasting beneficial consequences. Nor are the advantages of discipline, imposed by pharmaceutic studies, when rightly conducted, confined to their own circle; the habitual preciseness of reflection they engender, extends to other subjects, and facilitates the formation of correct opinions upon all things; the judgment, prepared and fortified against the attack of specious fallacies, or false pretensions, remains unbiassed in its decisions, undazzled by the glare that plausibility may throw around assertions, having the semblance, but not the reality of truth; it has settled principles to rely upon, and protected by the firm and serviceable Ægis which they form, is unaffected by the shafts that subtle error may direct.

In the delineation given, I believe that an over estimate has not been made of the services rendered by an enlightened profession, and that too high a valuation has not been placed upon its acquirements—they are eminently liberal.

Having selected this profession, and assumed its most seri-

ous responsibilities, the obligation rests upon you to acquit yourselves of them with fidelity. For the purpose of becoming competent to the fulfilment of your duties, you have attended the preparatory courses of instruction; you have familiarized yourselves with the leading facts and principles of the tributary departments of science, but here is not the conclusion of your labors; what you have so far accomplished can only be considered as rudimental; the ground work only has been laid of the edifice to be built hereafter; the materials you at present possess are not sufficient for its completion; a larger amount must be collected, and they can only be procured by sedulously cultivating the same pursuits: the just proportions into which they will be moulded, the degree of finish that will be communicated, will be indicative of your ability and industry. Hitherto, as pupils of this school, you have submitted to its authority, you have acknowledged its jurisdiction; but emancipated from its control, henceforward you are answerable to the public, and must seek its approbation; its favor will be awarded or withheld as you may appear deserving or unworthy.

When commencing a profession, the resolution should be formed, not to fall short of excellence; and this is in accordance with the natural impulses of an ingenuous mind. True superiority, however, is dependant on other circumstances, besides a spotaneous origin; it must be created by the endeavors of the individual who aspires at its possession. It is impossible to attain to it without exertion; if reached at all, it must be by diligence, energy, and vigilance; qualities which, if properly cherished and rightly directed, will lead to the best results. The irregular exercise of talents, called into activity upon extraordinary occasions which may be favorable for their display, may be productive of ephemeral applause, but the success that may attend the evidence of their power cannot outlive the moment, if they be permitted to relapse into sluggishness and inactivity. It is absolutely requisite that they should be employed in a way that will always contribute to some good purpose, constantly be conducive to some benefi-

cial end, and which, at the same time, will maintain them in a condition of readiness to meet the most urgent demands that may be made upon them. It is by this alone that efficiency is bestowed, which renders the struggle for advancement not fortuitous as regards the issue, while its possessor, moreover, can readily sustain himself in the elevated station to which he has been raised. Conjoined with uprightness and rectitude of conduct, the rewards are sure and permanent, for competency and usefulness are evidences of its possession. The superiority alluded to is essential to the pharmaceutist; without it, he can neither exercise his vocation with credit to himself, or with advantage to those dependant on him; it is understood to mean a thorough comprehension of every particular relating to his art, a facility and readiness of application under all possible emergencies, and to this goal his untiring efforts must be directed.

By tracing the history of Pharmacy trhough by-gone ages, and contrasting the conditions presented at different eras, we shall learn to appreciate the progress it has made. Here a close analogy will be found between it and other kindred sciences. From an examination of this kind, it will be perceived, that the supply of substances to be submitted to its manipulations has been greatly augmented, while the exactitude of these manipulations has been increased; that improvements have steadily been added, that accessions of every description have uniformly poured in upon it, contributing to render it more complete. Ready ingenuity and fertile invention have been expended in its behalf, with the especial object of better adapting it to fulfil its offices; nor have they been exhausted; endeavors having a similar tendency, are as energetically in operation, at the present time, as at any former period, and the same success attends them; to prove that such is the case, we need but refer to the announcement of new discoveries with which the numerous periodicals are teeming, and which each year brings into application. The pharmaceutist, therefore, cannot be stationary in his knowledge; adequate as he may be to the transaction of his busi-

ness when he begins it; he must keep pace with it; he must advance as it advances, otherwise he will be outstripped by more enterprising competitors. To maintain his standing, unremitting attention is indispensable, in order that he shall not be behind the information of the day, that he shall be enabled to appropriate to his own uses the latest improvements that have been made. In a word, it is important that he should be a reader.

It may be supposed by some, that the indulgence of studious inclinations is incompatible with those business habits which must be acquired before success can be commanded; be this as it may with other occupations, the pharmaceutist is obliged to prosecute his studies ardently; so to combine them with his more active engagements, as to have ample leisure for both; so to make the one subservient to the other, that intelligence and intellectual culture shall be apparent, and promptness, order, and regularity in the management of his concerns shall not be wanting. He whose deficiencies are obvious cannot expect to prosper, to secure the confidence of his fellow-citizens, to arrive at respectability. It is absurd to urge the plea, that time is not afforded to devote to the cultivation of that science, on a full acquaintance with which the very affairs depend that he is solicitous should thrive: it is but the subterfuge of ignorance; it may satisfy himself, but will not serve as an apology with the community. Neglect of either study or business is equally fatal; to each must be given a proper share of attention to form an accomplished pharmaceutist. To deal in drugs, to vend them merely, may not require the aid of science; but to modify them, to combine them, so that they shall fulfil the purposes of the physician; to render them fitted for administration to the sick, requires all the assistance that science is capable of yielding; and so surely as total failure will ensue, if undertaken without suitable qualifications, a corresponding result will be experienced, if such qualifications are not preserved, by a constant perusal of the treatises and publications devoted to the extension of the theory and practice of Pharmacy.

Nor ought the pharmaceutist exclusively to confine his reading to the subjects of his profession; he should make to contribute to his improvement a variety of information, which, by extending his ideas, and increasing his powers of usefulness, will enable him to become a more valuable member of society, without endangering inattention to his main pursuit.

Beside the possession of adequate knowledge, and sufficient skill to perform the duties of his profession, the reasonable expectation is entertained, that every one should use his exertions to promote its farther progress, and this is binding, in proportion to ability and opportunity. Science and art generally are more benefited by the limited contributions of the many, when taken in the aggregate, than by the more numerous additions of a few. How much greater is the proportion of names appended to a small number of observations, than of those upon which enviable distinction has been conferred by the extent and brilliancy of discoveries; and has it not often occurred that a single fact, announced by an unpretending individual, has been the starting point of important researches, by which exalted reputation has been obtained? How frequently has it happened, that a principle or law, that has revolutionized the whole body of doctrines previously accredited, has arisen from scattered, isolated truths, when to each has been given its appropriate position in a category; and yet he who has made a valuable observation, announced an unknown fact, or elicited important truths, is as well a benefactor of his age, as he who from them can fabricate a system. Could LINNÆUS or JUSSIEU, have formed their incomparable methods of classification, without subsidiary assistance freely procured by them from humbler laborers in the cause of Botany? Could LAVOISIER, DALTON, or GAY LUSSAC, have framed their respective theories of combustion, of atoms, of volumes, had they not been aided by antecedent and cotemporary operatives? Unrivalled as were the achievements which these illustrious men were capable of accomplishing, it would not have been possible for them to

attain so high a degree of eminence, to render themselves so worthy of admiration, had not the materials upon which to exercise their surpassing talents been abundantly furnished by industrious collaborators. The spirit of emulation should animate the inferior as well as superior functionaries of the temple of science; each one ministering at her altar should be zealous in discharging the duties of his station, for rank and dignity are apportioned as they are merited. All who can observe may render their services available, by recording the result of their observations, and thus contribute to the establishment of a common repository, readily accessible to those gifted individuals, to whom exclusively appertains the power to generalize effectually.

By taking a retrospective view of his profession, and fully comprehending the obstacles which have been overcome, the difficulties over which it has triumphed, the pharmaceutist will understand the means by which it has gradually assumed a position among the most estimable of which civilization can boast. If it be found that a high order of talent has been occupied with its details, it will, at the same time, be apparent, that indefatigable perseverance has been most effectual in bestowing so elevated a stand. Numerous examples might be cited to show, that discoveries the most remarkable, recorded on the pages of its annals, have been effected by the protracted exertions, not of one, but of many investigators; one or two of the most striking will be sufficient for illustration. Thus, the elaborate researches of PELLETIER and CAVENTOU, which eventuated in the entire development of the constituent principles of Cinchona, were preceded by those of GOMEZ, of DUNCAN, and of others still more antecedent; and the merit of having led the way in the detection of the ingredients of opium, is due to DEROSNE, SERTUERNER, and SEGUIN, while by ROBIQUET, PELLETIER, DUMAS, and COUERBE, have they been fully revealed, and made subservient to use. Such instances are not to be disregarded, as from them can be derived ample encouragement to make known novel phenomena, under whatever circumstances occurring, as sooner or later they will be correctly interpreted.

In a narrative of past events, those of the future appear prefigured. The same succession will take place. If therefore, the pharmaceutist be influenced by a desire to assume an active part in promoting the farther progress of his profession, he will allow no occasion to escape improvement; he will ever be upon the alert to seize the opportunities that may occur; nay, further, he will solicitously seek them; and the individuals to whom Pharmacy is most indebted, have manifested unfailing readiness in so doing. But I need not dwell longer upon such considerations; those which have been brought before you are too plain to be misunderstood; they cannot be otherwise than admitted. Let them, then, be treasured in your memory; accustom yourselves to apply them as a profitable lesson for your guidance.

In addition to personal inducements, and the debt due to science, there remains a purpose, to be accomplished by cultivating your profession, which is paramount to all others, and which should never be lost sight of; I allude to its elevation and maintainance at home, upon an equality with the highest standard of proficiency to be found elsewhere. In this resides a legitimate source of emulation, and with this end in view, even rivalry may be permitted, as universal benefit alone can flow from it. To such a cause may be attributed, in part, the extraordinary advances made by Pharmacy since the commencement of the present century; and we may judge, how active must have been the feeling, when between nations, foreign to each other, the echo of one reported discovery or improvement, was but the announcement of another. The pharmaceutists of France, of Germany, of England, seem especially to have been ambitious of the award of precedence, and by entering the arena of this praiseworthy competition, have exalted the professional reputation of their respective countries, at the same time, that by their united labors, they have bestowed innumerable blessings upon the world at large; among their number could be cited individuals, affording the noblest models for imitation, on whom the warmest expressions of eulogy might de-

servedly be expended. Agreeable as would be the occupation, I cannot dwell long, or minutely, upon the picture exhibited by the flattering condition of Pharmacy in the more favored regions of Europe, and I must turn to notice briefly its state in our own land, whither it has been transplanted. In venturing on this topic, I am aware the ground on which I tread is difficult, and I shall only introduce it so far as will enable me to carry out the tenor of the reflections on which I have already entered.

Pharmacy, with us has experienced some vicissitudes of fortune, and undergone changes of a nature calculated to conduce to its amelioration; these have in part been attributable to the surrounding circumstances by which it has been influenced, and partly to the well devised measures adopted by those to whom its guardianship has been committed. A long time has not elapsed, since it has been erected into a separate and independent profession, prior to which occurrence, it formed a portion of the avocations of the physican; the period had arrived when a separation became expedient, determined by the growing demands of the community, and the ample patronage that could be conferred upon a distinct body of pharmaceutists; such a step was well calculated to promote its interests. Among a people constituted like ourselves, of whom the predominant feature is stirring enterprise, prevalent among all classes and in every pursuit, it were not possible that Pharmacy should remain unaffected by the activity around; consequently, soon after the transfer alluded to was effected, its susceptibilities of better management and regulation were so evident to the enlightened gentlemen to whose hands it was intrusted, as to induce them to make an attempt to remedy its deficiencies; and the results evince the wisdom, zeal, and spirit by which they were actuated. Under their auspices, the basis of a reformation was established, the extent of which, though small at first, has gradually increased, and now holds out the prospect of universal prevalence. It enters not into my plan to specify the innova-

tions that have been made, the abuses that have been corrected, the imperfections that have been remedied, through their instrumentality; the contrast between the practices noticed at present in the shops of pharmaceutists, and those formerly to be met with, affords the fullest testimony on these points. Nor do I intend to expatiate upon the success of their endeavors to augment the facilities of information; to secure superior advantages of education for succeeding aspirants; to diffuse, extensively, knowledge upon all subjects connected with the profession; with these you are familiar, as in their enjoyment you have participated; but I would, by here referring to them, derive the incentives by which to stimulate your ambition, and urge upon you not to withhold your aid in hastening this great work of reformation, in demonstrating that Americans are not behind the age in talent or acquirement; and further exhort you, not to relax in effort, until the last vestige of foundation for the assertion has been removed, "that with us, Pharmacy, which has so greatly contributed to augment chemical science, and to enrich medicine with a host of new remedies, is considered rather as a business than a scientific profession."

In conclusion, I shall advert to a subject involving the standing of the profession as deeply as any of the considerations that have been insisted on, and which pertains to the high honor and strict integrity which should be preserved in all its transactions, and of which its practitioners should be most jealous. It has been remarked by a presiding officer of this College, on an occasion like the present, that Pharmacy is possessed of "tender reputation," an expression of its character as felicitous as it is true; at once intimating the readiness with which it may be tarnished, by acts the least at variance with the established laws of propriety, and the ruinous consequences that must attend their perpetration. Organized as the world now is, every honorable occupation may be perverted and disgraced by the designing and unprincipled, but such, especially, is the case with Pharmacy, which, from inherent causes, is more exposed and open than any other to the

practices of imposition, which either entirely elude or are difficult of detection. Its processes are complicated and necessarily elaborate; many of the substances with which it manipulates, either naturally possess a resemblance in sensible properties, or may be made to assume a similarity by art, more wonderful than alchymy. The persons to whom are dispensed its products, are generally the ignorant and unwary, who easily yield themselves the victims of deception; and as there are no legislative enactments by which it may be checked in its career, fraud in its Protean forms stalks with impunity throughout the land, amenable to no tribunal, and scarcely at the bar of public opinion. In the scheme of instruction with which you have been presented, it has been invariably an object to point out, and comment upon the methods by which fraudulent practices are accomplished, and to provide you with tests whereby to discriminate between spurious and genuine articles of the materia medica; in your hands this knowledge may be made a blessing or a curse, it may constitute you benefactors of your fellow citizens, or the veriest scourges that infest society. But I fear not that your acquirements will be applied to any improper uses. I entertain the belief that you have too long breathed a healthful moral atmosphere, to exist amidst the noxious vapors of imposture. I little apprehend a prostitution of your talents to the unworthy purposes of surreptitious gain; but rather possess the confident assurance, that by your future conduct you will evince the utter detestation in which you hold every thing approaching a dereliction of the most rigid honesty, and that, should ever sophistication, the opprobrium of your profession, be brought within your notice, you will lend your willing aid in its exposure.

Having now performed the task assigned to me, I shall terminate my remarks by expressing the hope that what has been said will be productive of future advantage to you. The matters of which I have treated are of the highest consequence, possessing an especial bearing upon the success attending your efforts in life; they constitute, however, but a

small proportion of those which might have been profitably brought forward; the void must be filled by your own information, aided by good sense and experience. Doubtless, by these means, you will arrive at the most correct views of duty, and will undeviatingly adhere to them. Yet I feel it obligatory upon me to remind you, that the contest in which you are about to engage is arduous, that all the resources at your command will be called into requisition, and the position you will assume, will depend upon the efficiency with which they are wielded; if failure be the result, you must sink into obscurity; if fortunate, you will be ornaments to your profession, and confer honor upon your *Alma Mater*.

ART. XV.—ON DICTAMNUS ALBUS. By AUGUSTINE DUHAMEL.

Names.—White dittany; *Dictame* (*Fraxinelle*) *blanc*, Fr.; *Dictamo blanco*, Sp.; *Weisser Diptam*, *Spectwurzel*, Ger.; *Dittano blanco*, It.

Sexual System.—Decandria. Monogynia.

Natural Order.—*Rutacæ*, DEC. *Diosmeæ*, R. BR.

Generic Character.—Calyx deciduous, five-parted; petals five, unequal; stamens ten, inclined, and covered at top with glandular tubercles; capsule with five carpels internally connected, compressed, bisperm.

Specific Character.—This beautiful plant, the only species of its genus, has two varieties, *purpurea* and *alba*. Its stem is about two feet high, simple, terete, flexous. Its leaves are alternate, winged, and impari-pinnate, resembling those of the common ash, *Fraxius excelsior;* hence its name of *Fraxinella*. The folioles are oval, shining and denticulate. The flowers, white or rose-colored, disposed in a straight and terminal raceme. The calyx and peduncle are viscous, and of a deep red. The petals open irregularly, and

the stamens are covered with glandular tubercles. The root, which is perennial, is long, thick and branched.

Habitat.—The White Dittany grows principally in the Southern provinces of France, Germany, and Italy.

History.—The specific name of this plant is derived from the color of the root, which has a strong and goat-like smell; this, as well as its bitter and aromatic taste is lost by drying. The American Dittany, sometimes confounded with it, is the *Cunila mariana.* The Dittany of the ancients, was the *Origanum dictamnus.* The White Dittany is cultivated for the beauty of its flowers, which appear in June and July, and though rare in America, may be seen growing in some of our gardens.

The whole plant is highly odoriferous, approaching somewhat to that of citron, but less agreeable. Some of the earlier works speak of flashes of light darting from the flowers at night, a phenomenon discovered by the daughter of Linnæus, which was attributed to phosphorescence, but this is satisfactorily explained by the following statement of later authorities. It is asserted that the emanation of volatile oil, which escapes from it in Southern countries, when in full bloom, and especially in hot summer evenings, when the vapor is more condensed, is sufficiently concentrated to be sometimes inflamed by the approach of a lighted candle, so that for a moment the plant is enveloped in a luminious circle or halo of fire. The effect, however, is not always general, as Mr. Biot, wishing to satisfy himself as to this fact, could only succeed in igniting, successively, the oily sacs, which surround the superior parts of the plant, by direct contact of flame, from which sacs the odor is evolved.

Properties and uses.—The bark of the root is the only part employed in Pharmacy. It is presented in pieces about an inch long, more or less thin, rolled up or flat, brittle, of a yellowish white color, possessing a feeble aroma and somewhat acrid bitter taste. If recently dried it powders with difficulty, becoming pasty under the pestle. For this purpose it should be well dried, and powdered in a covered mortar, as the light

particles that escape from it are exceedingly irritating to the nostrils and throat.

In the hot countries of Europe there is distilled from the flowers a highly perfumed water, which is employed as a cosmetic.

In commerce, the *medutillium*, deprived of its bark, is often substituted for the bark, but the fraud is easily recognised.

White Dittany is stimulant, diaphoretic, and vermifuge. Its chief use has been in epilepsy and hysteria, nervous fevers, and inveterate leucorrhœa.

It may be given in substance, infusion or decoction. Dose, ℈j. to ʒj. of the powder twice a day. A tincture is made in the proportion of two ounces to a pint of alcohol. Dose, twenty to sixty drops.

ANALYSIS.

Finding this plant had not yet been subjected to chemical investigation, I engaged in its analysis, not with the expectation of discovering some new alkaloid or detecting some peculiar hidden principle, but as much for my own satisfaction, as a desire to determine the principal constituents of the plant, and thus connect its chemical with the botanical history. I regret not having had some of the fresh plant to operate upon; but this being unattainable, I had recourse to a small quantity of the dry bark, which was all that could be found in our drug-mart.

A. *Experiment No.* 1.—A portion of the dried bark was incinerated in a crucible; the unconsumed product weighed one-tenth of the whole, having resisted the intense heat of a furnace.

2. To a portion of this residue, boiling water was added, and the whole thrown into a filter. The transparent liquid changed turmeric to brown, and restored reddened litmus.

3. Nitric acid poured upon the ashes caused a brisk effervescence; water was added to dilute it, and then filtered. The clear solution was then subjected by portions to experiment.

Ferrocyanate of potassa betrayed vividly the presence of iron, and oxalate of ammonia that of lime, by a dense white cloud. Caustic potassa and the mineral acids had no effect upon it. Traces of a phosphate were made evident by lime water,

which formed a precipitate that assumed a gelatinous aspect.

The presence of potassa was demonstrated by tartaric acid, forming a bitartrate. Nitrate of silver, hydrochlorate of baryta, and acetate of lead, caused precipitates perfectly soluble in nitric acid.

B. *Experiment No.* 1.—A portion of this bark, in a bruised state, underwent ebullition in several successive portions of water; the decoction possessed but little color, was very mucilaginous, frothed considerably upon agitation, was somewhat opalescent, and filtered with difficulty. Exposure to the air changed the residuum to an ashy-gray color.

2. The filtered solution was then subjected to the following experiments: With iodine in solution, starch was strongly developed. Sub-acetate of lead threw down a copious precipitate of gum and mucilage. Ferrocyanate of potasssa, tincture of galls and salts of iron had no effect. Litmus had no action. Oxalate of ammonia produced a slight cloud.

3. The decoction was evaporated to the consistence of thick molasses, which it resembled in color, smell, and adhesiveness.

A portion of this extract was boiled with caustic potassa in a silver vessel, but gave no indication of sulphur.

4. With another portion of this extract an aqueous solution was made, to which sub. acet. plumbi. was added to get rid of the mucilaginous matters, the excess of lead thrown down by sulphuretted hydrogen, this again driven off by ebullition, and ammonia added to the filtered liquid—but with no satisfactory results.

5. Some of this extract again submitted to heat, puffed largely, and, when dry, was pulverulent; further heat caused it to give out the smell of burnt sugar, and a spongy charcoal was left behind.

C. *Experiment No.* 1.—Treated some Dittany, finely bruised, with cold water by displacement, from which resulted a straw colored limpid liquid, possessing a fainter odor but much more acrid taste than that furnished by decoction, leaving an impression upon the fauces which remained some time

The peculiar nauseating odor was abundantly given out by exposure to heat, which, after several hours, caused a flocculent matter to be deposited, apparently vegetable albumen. Decomposition ensued after 36 hours.

D. *Experiment No.* 1.—Some of the bruised bark was placed in a retort with water enough to cover it, and heat applied; a colorless liquid was distilled over, having the peculiar nauseous odor of the substance in a high degree, but a less sensible taste. No appearance of essential oil.

E. *Experiment No.* 1.—A small portion of the bark in powder was digested in alcohol for several days, and then decanted. It was of a light straw color and limpid. Water rendered it slightly lactescent, indicating resin, though in small quantity.

2. This tincture was submitted to the action of heat, and by evaporation furnished a light brown extract imparting at first a sweetish but afterwards an acrid taste. It was found to be very soluble in alcohol, sparingly so in ether, and for the most part soluble in water.

F. *Experiment No.* 1.—A similar portion of the powder was digested in ether for several days, then decanted, and allowed to evaporate spontaneously. There remained upon the sides of the capsule a minute portion of colorless oil, which left a permanent greasy stain upon paper, but it was in too small a quantity to be isolated; washed from the capsule by alcohol, it was found to possess a very pungent taste. There remained in the capsule a small quantity of resin and extractive matter.

G. *Experiment No.* 1.—The residua of the alcoholic and etherial tinctures were further digested in boiling water, alcohol, and weak muriatic acid, successively, to take up the principles soluble in these *menstrua*. The remaining insoluble ligneous matter was decomposed by concentrated sulphuric acid, which, diluted with water, left an insoluble carbonaceous powder. With pure nitric acid, it was converted into a species of gum.

Nothing remains for me but to recapitulate the principles

indicated by these experiments. The bark of the Dittany contains: VEGETABLE ALBUMEN, GUM, STARCH, SUGAR, RESIN, EXTRACTIVE MATTER, A COLORLESS FATTY OIL, WOODY FIBRE, SALTS OF POTASSA AND LIME, AND IRON.

ART. XVI.—ON THE MANUFACTURE OF SULPHURIC ACID.

For several years past some manufacturers of France and England have been using a different process for procuring sulphuric acid than that which has hitherto been practised.

As we have not as yet seen any published notice of this method, we have thought that such information as we have been able to obtain from those who have seen this process in operation, would not be unacceptable to our readers.

The principal materials used in this method are sulphur and nitric acid aided by sulphuric acid and steam. The process is conducted in a suite of chambers (five or more) lined with lead. The only apparatus of which we have seen any diagram consists of five chambers of such a size as to produce 2900 lbs. of concentrated acid per diem. Four of the chambers are of a small size, and the other very large, and arranged to suit the convenience of the manufacturer in the following order. First, two of the smallest chambers, next the large chamber, and finally the other two, which are somewhat larger than the first, the smaller chambers being elevated to the ceiling of the largest.

Outside and near to one of the smallest chambers is to be placed a burner or vessel for the combustion of the sulphur, sufficiently large to hold the daily charge requisite for the supply of the chambers. This burner communicates with a small chamber by means of a large pipe which enters near the ceiling; this chamber then communicates with the next small chamber by means of a large pipe which commences near the bottom of the first, and ascends and termi-

nates near the ceiling of the other; this latter then communicates with the large chamber in the same manner.

The communication between the large chamber and the third, and between the third and fourth chambers, is somewhat different; the pipe connecting the largest chamber with the next is smaller in size than the former pipes of communication, and commences in a similar manner near the floor; after its exit from the large chamber it descends and enters the top of a box; from this box a second pipe ascends and enters near the ceiling of one of the second size chambers. From this chamber a similar pipe passes out, forming a communication with the last chamber, the same in every respect as that just described.

The last chamber has the same kind of pipe and box, but instead of being connected with another chamber, it communicates with the external air by means of a long terminal pipe.

The boxes mentioned are intended for the condensation of such acid vapours as escape condensation in the preceding chambers. Besides these pipes of communication for the conveyance of the acid vapors, there are small tubes by which the acid on the floor of the smaller chambers may be conveyed to the larger; the second chamber is thus connected with the first and this latter with the large chamber, while the last is in the same way connected with the fourth and this again with the large chamber; all these communications being commanded by stop cocks. In the sides of each chamber there are holes so arranged near the floor as to allow the inspection of the depth of the liquid and the withdrawal of a portion for examination. There are also doors in the side, and in the top a hole for the examination of the interior of each chamber. In the second chamber are placed several earthenware vessels each one higher than the next in succession, in such a position that when overflowing, the contents of the first may fall into the second, of the second into the third, and so on, those of the last falling on the floor of the chamber. A glass tube bent in the form of a syphon passes through the side of the chamber and goes to the bottom of the first vessel; this tube is connected at the other end by a stop cock with a glass funnel. This

funnel is intended to contain the nitric acid necessary for nitrification. The last part of the apparatus to be mentioned, is the steam boiler: this is of a low pressure kind, a half to one atmosphere being all that is required; it sends off two leaden pipes, which pass, the one into the pipe of communication between the second and third chambers immediately before its termination in the large chamber, and the other in a similar place in the pipe of communication between the third and fourth chambers; the orifice to allow exit for the steam is small; sometimes there is an additional pipe to the large chamber.

To set this apparatus in operation, the burner is to be charged with the sulphur, the nitric acid put in the funnel, the floors of the chambers to be covered to the depth of two inches with dilute sulphuric acid, and the earthenware vessels charged with strong sulphuric acid. The acid in the chambers should be of different degrees of dilution; in the first and second chamber strong; in the large, weaker; and in the last, weakest.

The nitric acid is to be allowed to run slowly into the chamber, and the steam boiler is set in operation for about one hour or more, when the sulphur is to be ignited and the combustion regulated by means of the doors in the burner. The entrance of steam into the chambers is to be regulated according to the appearance at the end of the pipe of exit; when there is too much steam, a large quantity of white vapor passes out; when too little, a small quantity; and when in exact proportion, the fumes of nitrous acid are distinctly perceptible.

The apparatus is kept in operation day and night without cessation. As soon as one charge of sulphur is burnt out the residue is withdrawn, and a fresh charge added, during which time the nitrification and steam is still kept in operation.

The acid in the small chambers is allowed to run into the large one according to the strength of the acid in the former and the depth in the latter. When the acid has accumulated in sufficient quantity and of proper strength in the large chamber, it is withdrawn for concentration, which is performed in the usual manner.

By this process every 100 pounds of sulphur yields 290

pounds of concentrated acid, at the cost (in Paris) of 1¼ cents per pound. The above proportion is about the theoretical quantity to be given by 100 pounds of sulphur; the sulphur used containing five per cent. of impurity. The quantity of oxygen yielded by the nitric acid used, is about one-fifth of that required to oxidate the sulphurous acid; the remainder must of course be supplied by the atmospheric air, which obtains access into the chambers.

The theory of the formation of sulphuric acid by this method is somewhat obscure, and we can only attain to a perfect knowledge of it, by knowing what interchange of elements takes place within the chambers. But from the known fact that sulphuric acid cannot be made by these means, unless the water in the chamber is previously acidified by sulphuric acid, it is probable that this acid acts as a catalytic agent in producing the decomposition of the nitric acid, and that thence the same phenomena result as in the process for the manufacture of sulphuric acid by means of sulphur and nitrate of potassa.

R. B.

SELECTED ARTICLES.

ART. XVII.—ON THE APPLICATION OF PLATINUM UPON OTHER METALS. By M. Melly.

Every one is aware of the great advantages in chemical operations, which vessels of platinum have over those of all other metals, without exception. The greatest obstacle to their more extensive use, is their high price. Vessels of platinum, especially when of large size, as alembics, retorts, evaporating dishes, &c., are necessarily thick for the purpose of resisting injury, and the quantity of matter is very considerable, so that their price is then very high. It would, therefore, be useful to discover some means of constructing some instruments possessing the advantages of those made entirely of platinum, and of which the price should be infinitely less.

To accomplish this purpose, M. Melly has attempted to use platinum with a thinness much greater than ordinary—but supporting it by another metal, to which it remains applied. All that is to be desired in this respect has not been obtained, but the experiments may induce some practical chemist to continue the researches, and improve upon them so as to obtain complete success.

Three different processes have been tried to apply the platinum upon other metals.

The first of these modes is by compression. Here it is endeavored to attach the platinum by the processes already in use in plating with silver and gold, that is to say, to unite platinum upon copper or on brass by means of very strong pressure, in the hope of causing an adhesion in a solid manner,

and express all the air lodged between the two plates. The pressure, to effect this, should be very great, and the preliminary experiments with a roller not producing the desired effect, attempts were made with a hydraulic press at a pressure of about thirty atmospheres. The first attempt was made about two years since, upon a plate of two inches; and since, the experiment has been repeated many times upon plates of three and four inches square, and on plates of five and six inches in length.

To prevent costly and useless attempts in those who desire to repeat these experiments, the following details are given:

A very pure piece of platinum in the form of a square and thin plate is to be taken, together with a plate of copper somewhat larger and much thicker. The pieces are to be thoroughly polished, more especially on the sides which are to be in contact; they are then to be placed the one on the other, and being pressed close together, they are to be enveloped in a thin band of copper wound around in a spiral, (this precaution is indispensable to prevent the oxidation of the copper on its interior surface.) This being complete, they are to be rapidly heated in a forge previously in operation, and when a red heat is attained, they are taken out, placed under the piston of the press, and rapidly compressed while yet red. On being released from the piston, the two pieces will be found united, the plating with platinum being completed in a very short time, but a few minutes sufficing for the experiment when every thing is prepared.

The experiments by compression give very good results; the adhesion between the two plates takes place over the whole surface; the two pieces are perfectly united together, and by passing them between rollers we can obtain very thin plates.

By this first process, we may obtain vessels of great thinness as to the platinum, while at the same time protection is afforded by another metal with which it is connected. The proportion of the metals in the experiments made, was as one to thirty, and the platinum on each square inch weighed only

350 milligrammes; consequently a capsule with 40 square inches of surface, containing about five ounces of water, and capable of being used for all chemical purposes, as far as the internal surface is concerned, would cost when finished but thirty francs at most, while if wholly of platinum, and thin as possible, it would cost two hundred at lesast.

The second process which was employed was the use of an *amalgam*. A similar process has for a long time been in use for gilding by means of a mixture of mercury and gold and is an operation which succeeds very easily. It was therefore natural to try whether an amalgam of platinum would afford the same success. After having tried without success by several modes to prepare this amalgam, the following was hit upon. Platinum sponge (made at a low temperature, so as to be obtained in as minute a state of division as possible,) was taken and lightly broken up between the fingers; it was then passed through a sieve of silk, and placed in a well cleaned iron mortar along with a certain quantity of mercury; the bottom of the mortar was then slightly heated, and the mixture rubbed up for half an hour without intermission, under a chimney with a good draught; the mixture was then complete. The proportion which gave the best results were 100 of mercury for five of platinum. This mixture is heavy, pasty, and easily moulded in the fingers; by means of chamois leather we may express part of the mercury.

Nevertheless, if we attempt with this amalagam, to cover different metals with platinum, it will be found that some obstinately refuse to receive this amalgam, as for example, iron and copper, while silver and brass are easily covered with a film of platinum. This operation is, however, very delicate; it succeeds tolerably well with the silver of any ancient coins, because the impression is shallow, and they can be heated with safety. But the platinum deposited in this way is dark, porous, hardens with difficulty, does not adhere well when the mercury has been driven off by a low heat, and if heated still more, it frequently penetrates the substance of the metal

itself, and forms an alloy with the interior without covering the surface.

Finally it was attempted to cover some of the metals with platinum in the moist way. It is known that a metallic bar plunged into a solution of another metal, precipitates this latter, if it is the most oxidisable metal, and if the new salt formed is soluble. But this metallic deposit takes place in an irregular manner, frequently in small plates, in powder, or in crystalline grains, and does not apply itself upon upon the metal in such a manner as to cover it completely. An endeavor was made to ascertain whether the metal of the solution could not be compelled to remain applied to the surface of the precipitating metal, and thus cover it completely.

When a bar of iron or copper is plunged into an ordinary acid solution of chloride of platinum, the platinum is precipitated, but, as a gray powder, and in small plates; it does not remain applied to the bar, but soon falls to the bottom of the vessel. It is probable that the disengagement of hydrogen which takes place at the same time as the precipitation, occurring between the two metals, detaches the latter as soon as it is deposited; moreover, the metal becoming covered with a coating of oxide, this is of itself sufficient by its interposition to prevent the adhesion of the metal.

By modifying in different manners the circumstances of this experiment, a method of applying the metal in uniform and smooth layers has been obtained. But it is necessary to observe many precautions, without which the attempt will be imperfect, or fail completely: 1, the solution of platinum must be neutral or alkaline; 2, it must be much diluted; 3, it should be hot, (about 60 c.;) 4, the contact of the metal (well polished) with the solution should be of short duration; 5, finally, the piece covered with platinum should be immediately washed in pure water. Without these precautions the platinum is precipitated as a black powder, but little adherent, which is easily rubbed off, and cannot acquire any polish.

Of these three processes the last is certainly the most easy, the quickest, and the most economical; a solution of platinum,

such as was used in the experiments, would answer to cover a great number of vessels; besides, this process permits us to repair our instruments ourselves, whenever they are injured. But, we must confess that it is as yet too imperfect for chemical uses; the platinum is not sufficiently adherent, and does not well resist strong acids; it may, however, furnish some useful applications, and perhaps become perfected. The second process, the amalgam with heat, is likewise of little cost, but there is much to be desired with regard to it. The first process, on the contrary, is costly, more difficult to execute, but it perfectly answers the desired object, and certainly merits the preference; the evaporating vessels covered within with platinum by this mode, answer the same purpose as those made entirely of platinum. We might, perhaps, for some purposes, cover both surfaces, or unite two methods, covering the interior by compression and the exterior by precipitation or amalgamation.

Acad. Roy. des Scien. Jour. de Chim. Med.

ART. XVIII.—OBSERVATIONS ON THE ANATOMICAL AND PHYSIOLOGICAL NATURE OF THE ERGOT OF RYE AND SOME OTHER GRASSES.

By Edwin J. Quekett, Esq. F. L. S. &c. Lecturer on Botony at the London Hospital and Aldersgate School of Medicine.

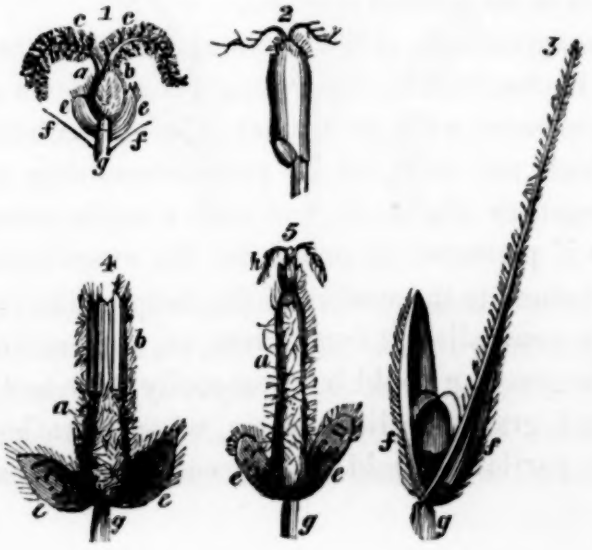
[*Abridged from a Paper read before the Linnean Society, November* 4, 1838.]

The investigation of this peculiar formation has often occupied the attention of both English and foreign botanists, with the view of determining its nature and origin; yet notwithstanding the mystery belonging to it has not been completely removed, the observations of some of the latter authorities have gone far towards our viewing this substance in a clearer light, especially those of Dr. Phœbus, in the *Deutschlands*

kryptogamische Giftgewächse, and of Philippar, in his "*Traité Organographique et Physiologico-agricole sur l'Ergot, &c., dans les Cereales;*" from both of whom we learn much interesting matter, and also the history and former hypotheses of the ergot, which here will be omitted, for the sake of shortening this communication.

After many attempts at the examination of the ergot of rye in the state it is generally found in the shops, I could never succeed in finding any thing from such specimens, respecting its structure, that served to identify it satisfactorily with any other vegetable production; consequently it has long been my wish to obtain recent specimens of the rye, or any other ergotized grass, in order to trace the growth of the ergot from its first commencement, which I have this year been enabled to do; and one grass in particular, the *Elymus sabulosis*, a plant much larger than the rye, has afforded an excellent illustration of the growth and development of this anomalous formation.

In order to trace the ergot through its several phases, it is necessary to become acquainted with the normal size and characteristics of the grain of the several grasses, in its various stages, whilst healthy, and also the same conditions of its appendages, which may be probably understood from the figures and following description. When this examination is made



at an early period, it is found that the young grain of the rye is composed of a body or ovary minutely hairy, and of an oval form, (fig. 1, *a*), which is surmounted by a small crown of stiff hairs (*b*), from amidst which the two styles (*c c*) bearing plumose stigmas, take their origin from the apex of the grain; at this time the embryo is almost invisible; its place is seen at (*d*); below the grain can be observed the apex of the minute stalk or receptacle (*g*) on which it rests, and from which arise the two scales (*e e*) that cover the base of the ovary; the lines (*ff*) in fig. 1, show the position of the paleæ (*ff*, fig. 3). All of these organs, as well as their position and structure, it is necessary to bear in mind, in order to judge of their alteration in the diseased state.

When the grain of rye is matured, it frequently retains the remains of the stigmas and its hairy crown, as at fig. 2, *b* and *c c*, and always presents an enlarged embryo at its base (*a*), which is joined obliquely to the albumen (*d*) above, and is articulated inferiorly, together with the albumen, to the receptacle (*g*).

When the healthy condition of the young grain was clearly made out, it could easily be seen when that state would be departed from by any particular grain about to become replaced by an ergot; and it is seldom that more than two or three occur on the same spike, as represented in the figure, where the ergot is in its natural position.

The first appearance of the commencement of the growth of the ergot is observed by the young grain and its appendages becoming covered with multitudes of minute cobweb-like filaments, which run over all its parts, cementing anthers and stigmas together (fig. 4, *a*), and with a white coating, which appears as if plastered on or left by the evaporation of some liquid, and stuck to the surface of the body of the young ergot, completely concealing it from view, as represented fig. 4, *a*. This white covering could be most easily detached by placing the infected grain in a little water, when countless numbers of minute particles would be loosened from its surface, and

ultimately subside to the bottom of the vessel containing the fluid.

On many parts of the spike of the elymus, as well as on the rye, can be observed a viscid fluid, which, according to Philippar, oozes out of the ergot in the stage just described; and the greater the quantity the finer the ergot will be in that particular flower. This liquid is in abundance on the elymus,

and in the morning numbers of drops can be collected. I have rather given this an external origin, from the water of dew or rain becoming charged with the particles whilst lodging on the plant;* for my specimens when cut and placed in water, though they kept alive, exuded no viscid liquid whilst in doors; however, it may arise from the young ergot, as Philippar says, for I have not had many opportunities of watching the increase of this fluid on the growing plant. This fluid is slightly sweet, and contains myriads of the same particles as are deposited on the outside of the ergot. The axis of the ergot, when first appearing, is exceedingly soft; breaking easily across or in any other direction, and exhibiting, in its transverse section, a very irregular lobed or sinuous margin, of a purplish color, which is surrounded externally by the above-mentioned filaments and and particles; this axis appears to be the body of the grain, which has now become changed by the presence and growth of the particles and filaments found upon it.

At this early period the size of the ergot is very small, measuring scarcely one-fifth of an inch; still its diminutive condition seems to be most favorable for the support and growth of the particles and filaments upon its surface (where they increase most rapidly;) for it is found that whilst the ergot is enlarging, there is not a corresponding increase in the number of filaments and particles, but rather a diminution of them, whilst it is advancing to maturity.

In the next stage (fig. 5) we observe the ergot is now grown to show itself just without the paleæ, and begins to show its purplish-black color, having by this time partially lost its white coating; in fact, when the ergot becomes visible by protruding between the paleæ, the production of filaments and particles has nearly ceased, and the ergot increases in a very rapid manner, according to Philippar only eight or ten days being required to complete its development, attaining in this

* It was found that when water is charged with a sufficient quantity of the particles adhering to the ergot, that it becomes viscid and sweetish, and evaporates very slowly; in fact, resembles the fluid that is observed on the exterior of the flowers of ergotized grasses.

short period a size four or five times larger than that attained by any healthy grain of the same plant in the same period.

The last stage of the ergot is, that it has elongated much beyond the paleæ that once inclosed it; and puts on a violet-black colour, from the diminution of the filaments and particles that infested it previously. Its length is found to vary in this state from half an inch to one inch and a half, in different specimens. Its form is seldom cylindrical, more frequently obscurely triangular, each side being marked with a furrow, one of them being generally deeper, and more conspicuous than the other two: besides these natural marks, there are a variety of cracks and fissures extending in many different directions. Either end of the ergot is inclined to be pointed, but the lower end more so, and presents a rather smooth extremity or cicatrix, by which it is articulated to the receptacle, between the two scales seen in figs. 4, 5, 6, (*e e.*) which are not destroyed by the unnatural growth that springs from between them, and it is extraordinary that Philippar makes no mention of these bodies at the base of the ergot. The summit of the ergot is surmounted (in those specimens which have been carefully gathered) by a small body, which is composed of the remains of the styles, the hairy crown, and a certain portion of the withered grain, as at figs. 5, 6, (*h h*); this body does not exist on the majority of specimens that are procured in the shops, because a very trifling force is sufficient to separate it from the apex of the ergot.

These observations are such as can be easily made with very little microscopic assistance, and have been probably witnessed by those who have previously paid attention to this subject, and who have given us various opinions respecting its nature; most of which tend to the describing the ergot as a particular fungus, to which we have the different names given by the following botanists, viz. *Sphacelia segetum* by Leveillé; *Sclerotium clavus* by De Candolle; *Clavaria clavus* by Münchhausen; and lastly, *Spermoedia clavus* by Fries, who considers it more analagous to a diseased grain than to any species of fungus.

The contrary to these hitherto received opinions being about to be here advanced, from the results of many examinations of the ergot, in different conditions, and in different grasses, it is fair to explain the reasons for arriving at other conclusions, and those which lead me not to adopt the views of former investigators.

It has been shown that when the young grain of the grass is examined in the healthy state, that its summit bears a tuft of hairs, (particularly evident in *Elymus sabulosus*,) and the two stigmas which spring up amongst them, and at the base of the grain can be observed the two scales, and below the scales is the apex of the pedicle or receptacle, which serves to support the grain, the scales, and the paleæ, seen in fig. 1, and fig. 3. This structure is readily made out in the very young state of the grain, and can also be observed only more or less shrivelled by age, in every condition of the ergot up to its maturity, when the specimens are carefully selected for the purpose, all of which is accurately figured by Phœbus; then as these organs form the appendages at either end of the healthy grain, and they do the same in the ergot, there can be no doubt that the body between these organs in the healthy state is the grain; consequently the body that occupies the same position, but in an altered form, ought to be certainly no other than a grain, which differs from a healthy one, from having in its early state supported a parasite, which communicated to it some disease, which has perverted the normal state of its development. Notwithstanding the several parts of the grain are arranged as described, Philippar makes out the ergot, from his examinations, (which are the best of the later investigators,) to be a separate fungus; still his expressions* are rather vague respecting it, for, speaking of the ergot, he sometimes styles it "ergotized grain made up of fungic substance is the receptacle of the reproductive particles;" in another place, "that the ergot, as a fungus, springs from the receptacular point of the sexual

*Vid Traité Organographique, &c., pp. 121, 122, 123.

organs;" and lastly, he sums up by considering the "ergot as being the reproductive apparatus of a fungus." Philippar's reason for considering it a fungus arises principally from the microscopic examination of the structure of the ergot, which, as a fungus, he describes, beginning in the receptacle of the flower, and lifting up the sexual organs, which are diseased, but still remain upon the apex of the ergot, as in fig. 4; but it is found that where the paleæ are attached, and also the two scales, that this part which must be receptacle also, is not diseased, for these organs remain undisturbed; consequently it can only be the point where the grain and the receptacle unite that could give origin to any body taking the position of the ergot. Yet from this point, which is inseparable from the grain in the young state, it is most singular that in every kind of grass yet found ergotized, that the fungus should always burst through the tissue at this particular point, and at that particular time when the flower is about to expand. If it be a fungus solely, it ought certainly to burst forth as an ergot from the stem, or some other place on the several grasses, besides growing between and parting asunder two organs, which were as firmly united to each other in the young state, as the paleæ or glumes are to the same axis. Beside, the ergot, when matured like the ripe grain, slips out of the paleæ like a ripe filbert from its cupule, showing it has no organic connexion at this period with the receptacle more than the grain had. Philippar's examination of the internal part seemed especially to strengthen his view of its being a fungus; for he describes the body of the ergot to be composed internally of branched short fibres, and globules of various sizes, round and oval, which he considered the means of its reproduction. My own observations on the structure of the ergot differ somewhat from this, by believing that the fibres described are the boundaries of irregular cells, distorted by the fungoid matter, and not fibres at all; and the globules are not reproductive bodies, but those of a fatty oil which is contained in the interior of the cells, as seen fig. 7, in a transverse section magnified 1000 times. To witness these facts, take an ergot, scrape away with a knife all

its black coat, so as to remove all the particles that adhere to its surface, then to make some very thin transverse slices, and put them on a slip of glass under the microscope: and when water is added to them, it speedily becomes turbid or milky, from the quantity of particles that have escaped from the sections; these particles, however, are not heavier than the water, as those on the exterior of the ergot are, but are lighter, and collect on the surface, from whence they can be removed like cream from the surface of milk. When magnified, these particles are found to be of vastly many sizes, some as large as 1-1000th of an inch in diameter, others so small as to be barely visible when viewed to the extent that optical powers can assist us, and appear, when magnified, 1-1000th linear, very like the globules in human milk. When the water in which the slices have been placed is heated, these minute globules liquefy and run together, forming either very large globules or numerous irregular masses; their primary form, by this operation, being completely disturbed, which would not have been the case had they been "seminules," or reproductive agents, as Philippar imagined. To observe the structure of the ergot, make some thin slices, then boil them in ether, which dissolves the fatty matter, and makes their structure become visible, which is to all appearances irregularly cellular, and not fibrous.

Another argument against the ergot being a complete fungus is, that the particles which are its reproductive agents are most numerous when it is young, and it continues its growth after their production has ceased, which is contrary to the usual law amongst this class of vegetable productions; for their efforts to live are only to develope the means for propagation, dying, as it were, the instant this action has been accomplished.

Besides these, Vauquelin's chemical analysis proves its dissimilarity in composition with the FUNGACEÆ, and even with Sclerotium—a genus of that order to which the ergot was assigned by Fée and De Candolle—by containing very different constituents, which are the following :—

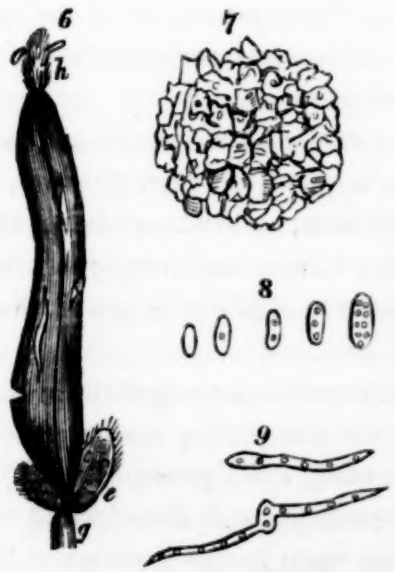
Coloring matter, soluble in alcohol.

White oil, very abundant, sweet.

Violet matter, soluble in water.
Fixed phosphoric acid.
Azotized matter, very abundant and alterable.
Free ammonia, at 100° Reaumur.

Thus far the argument against the ergot being a species of fungus are taken from the body itself; but by experiments and minute examinations of the particles which separate from its surface, or are found in the viscid fluid which lodges externally, additional proofs can be obtained that corroborate the former views of its nature.

When these particles are placed under a microscope, and magnified about 1000 times (linear) their minute structure becomes then discernible, and their shape is seen to be oval or elliptical, and occasionally a little contracted about midway, and contain several green granules, whose number varies in different particles; most frequently there are one, two, or three well defined spots in their interior, and occasionally there are as many as ten or twelve; and there can be no doubt that these minute bodies are the reproductive agents of a particular fungus, to which particles the term *sporidia* is applied, to characterize them, because their structure is unlike seeds, notwithstanding their office is the same. Various conditions of these are seen at fig. 8.



FIGS. 6, 7, 8 and 9.

The size of these sporidia, upon an average, is about the 1-4000th of an inch in length, and 1-6000th of an inch in diameter, and the number on each ergot is uncertain; but as so many have been rubbed from one specimen as would fill a square inch of surface, it is probable, from the above measurement of their size, that about twenty millions may be calculated as an average number on a full-sized specimen; and as an example of the extreme minuteness of organic matter, some of these sporidia contain eight or ten granules, which are so small that it would require 200 millions of such to cover the same surface, their size being not more than 1-50,000th part of an inch.

If these sporidia be kept moistened with water on any suitable surface, or on a piece of glass, which is covered with a thin piece of talc, after a time it will be observed that these minute bodies commence germinating in various ways, and with me have continued to grow in this manner nearly three months.

The most common method is that of the sporidia emitting a tube or tubes from some uncertain point or points, (fig. 9,) but generally opposite the spot where a green granule is lodged in the interior. This tube increases to an indefinite length, and contains throughout its interior similar green granules, arranged at short but generally equal distances, about as far from each other as they are in the interior of the sporidia; and I believe that this tube ultimately separates into fragments, constituting as many new ones.

In many other instances, the sporidia, instead of producing a tube, give origin, opposite a green granule, to a minute bud; this little point increases, and ultimately separates from the parent as a perfect sporidium, and frequently before its separation shows an indication of producing a similar one from itself, (fig. 10.)

Another way of increase amongst these singular germs is, that of the membrane composing the parietes of the sporidium breaking down, forming a flat patch, (fig. 11) which keeps extending in all directions, and developing upon itself green granules, such as are seen in the interior of the other sporidia.

These granules seem important points, and appear to be analagous to the embryo of the seeds of more highly organized plants.

The last and most remarkable manner of germination is that of the sporidia, having a septum formed across their interior, by a green granule extending itself laterally, which divides them into two parts, each of which becomes again divided by a similar process, seen at figs. 12, 13, 14, 15. By a repetition

of this method there at last is formed a monilform filament, which, though simple in its origin, ultimately becomes branched, the branchlets most commonly radiating from a central collection of cellules. These filaments are the analogues of minute stems, and at a certain age give off, from innumerable points of their surface, little germs, which in a short time increase and become perfect sporidia, as seen figs. 16, 17 (*a a a*) which commence again in the several methods of germination just detailed. As the minute filaments belonging to one plant get what may be termed, ripe, the mass of cellules that have been developed about those first generated in the centre become to be considerably condensed and pressed together, as at fig. 17, (*b*,) so as to lose the distinct boundaries they originally possessed; and they begin to assume a brownish-yellow color, and in fact, look now exactly like a section of the body of the ergot itself.

Here then has been witnessed by daily examinations, the growth of these sporidia, which, being found on the ergot of every grass, are without doubt connected with the cause of its

origin; these examinations show their various methods of germination, and their advancement to maturity and ultimate ripening, or producing the means of their reproduction; yet this minute plant does not measure more than 1-300th to 1-100th part of an inch in length or breadth.

The fact of having caused these minute plants to grow, independent or not connected with the body of the ergot, and without assuming any form in the least way similar to it, is the most convincing proof that the flocci, or arachnoid filaments, and the particles, before mentioned, occurring on the surface of the ergot, are no part of that body, but are the microscopic plants just described, which choose the grains of many grasses as the matrix of their developments, such plants belonging to the order of vegetables denominated Fungaceæ.

There are other proofs of the independent existence of the microscopic fungus, for it is found that it is not exclusively confined to the grain as a locality, but is observed to flourish on many other parts of the same grass, viz. in the interior and on the exterior of the anthers, on the paleæ, on the glumes, and on several parts of the rachis of the infected plant; but not occasioning there any exuberant growth of the part, for obvious reasons; because these parts have completed their development before the fungus makes its appearance; and their structure is not like that of the grain, which, at the period of the attack is exceedingly young, and just commencing to grow rapidly, and susceptible of impressions which can easily pervert its form and structure.

I conceive from the foregoing remarks that my examinations have proved that the ergot of the rye, as well as other grasses, is produced by a particular species of fungus, which developes itself upon or in the grain, whilst the latter is very young, causing its remarkable alteration from a healthy grain, in form, color, chemical composition, and properties.

The method by which this singular production probably originates (for at present all respecting this part is uncertain) is, that the sporidia of this fungus are by some means introduced into the interior of the plant, and ultimately arrive at

the grain, which they find the most suitable matrix for their development, or they are brought into contact with the young grain by some means (probably by the fluid) from without. In either case, when they come into contact with the grain, they lose no time in the work of reproduction, emitting their filaments through the tissue of the grain, and covering its body with multitudes of arachnoid filaments bearing sporidia, and apparently destroying its coats, as the matured ergot posseses no envelope.

Their presence communicates disease most frequently to the entire grain; sometimes, however, I have thought that the embryo only has been diseased, a part of the albumen remaining, along with the hairy tuft, on the apex of the ergot. This diseased action does not, I imagine, entirely deprive the grain of the power of growth, for it lives after the effects of the parasite have ceased: but it vitiates all its constituents, for neither starch nor gluten now exist, but instead, abundance of oil, which I suspect is produced by the grain, as none is seen from the microscopic plants whilst germinating in the way already described. As the ergot increases in size, it is made up partly of the diseased structure of the grain, and the fungic matter which has grown within it, which is like that observed when the parasitic plant grows unconnected with the grass, not being sporidia, but condensed cells such as compose the filaments, as at *b*, fig. 17.

To state my opinion, derived from experiments and examinations, which have been made and repeated again and again, in order to obviate every source of error arising from the manner in which they have been conducted, I would say, then, that I consider the body known as ergot to be a mass composed of the constituents of the diseased grain, mixed with fungic matter, occupying the place of the healthy ovary, of which can be observed some retained relics in its triangular shape, and the furrow on one of its sides, both conditions being those of the perfect grain also.

Since it has been, I trust, demonstrated that the ergot is no longer to be considered an independent fungus, it has become

necessary to alter its previous botanical relations, by dismissing the former appellations, and giving a new one to the minute plant, which is the cause of this singular production.

From comparisons with the characters of the present little plant, and with those of British and foreign genera of FUNGACEÆ, it has been found so unlike any of them, as to deserve being made a new genus, to which I have given the title of *Ergotætia;** and, after repeated examinations in the rye and other grasses, I have not hitherto found any material difference in the organization or characters of this parasite to warrant the making of those belonging to different grasses into different species, therefore I apply the specific term *abortans*† to the fungus found on the rye, and believe those on other grasses to be the same species.

This minute plant, from its structure and habit, will be classed in the suborder of FUNGACEÆ, *Coniomycetes* of Fries, and in the tribe of *Mucedines*.‡

Though many of these observations were primarily made with the elymus, because I had the plants in the growing state, yet the same experiments with the sporidia of the rye have been repeated, and with the same results, and the anatomy of the body of the ergot in both and in other grasses, seems to correspond in every respect.

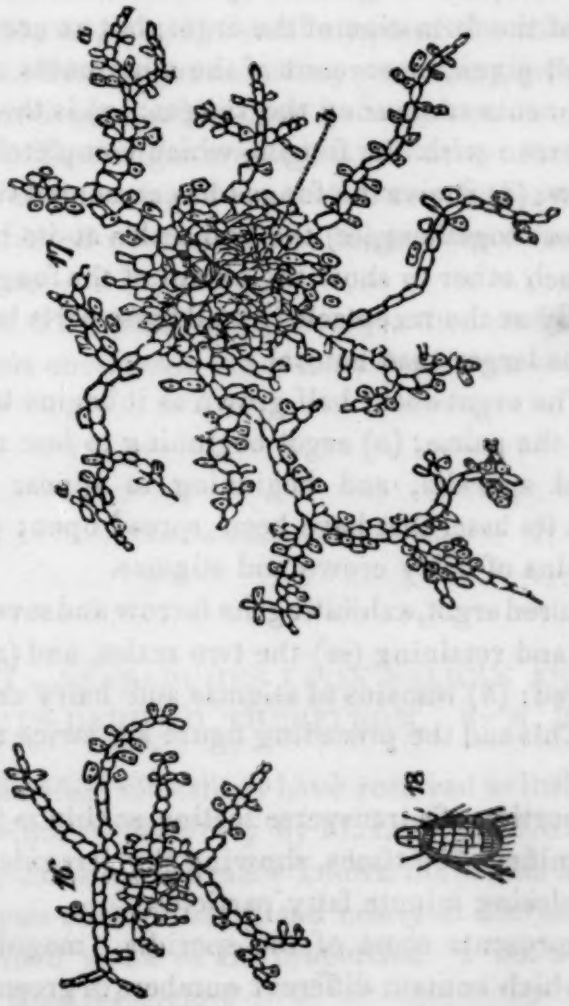
This is a point which, as regards the goodness of the ergot of rye, is deserving mention in this place, from having found, in numerous instances, that the specimens have frequently been not much more than hollow cases, instead of being solid. On looking for the cause it was found that these effects were

* From Εργωτη, *Ergota*; and αιτια, *origo*.

† The term applies directly to the fungus destroying the germinating power of the grain, and indirectly to the medicinal properties of the ergot.

‡ In Berkley's arrangement of the British Fungi, *Ergotætia* will be placed in the suborder *Hyphomycetes*, and in the tribe *Sepidoniei*, which is composed of plants having filaments not sporidiferous; the sporidia being heaped together, and lying upon the matrix, which is nearly the case with the parasite of the ergot, whose filaments do not often bear sporidia, or if so, not one-hundredth time so frequent as the sporidia develope one from another, forming a mass which completely invests the body of the ergot.

produced by numbers of small acari, (fig. 18) which devour the interior, thereby rendering such specimens nearly inert, and producing much powdery excrementitious matter about the ergot, similar to that observed with those species that dwell in cheese, or devour malted or other corn; therefore, the practice of keeping camphor, or some strongly smelling body with the ergot, is likely to be a preventive to the attacks of these tiny depredators.



EXPLANATION OF THE FIGURES.

FIG. 1 represents the young grain of rye twice its natural size, (*a*) being the ovary crowned with hairs (*b*); (*c c*) the feathery stigmas; (*d*) the place of the embryo; (*ee*) the two scales at the

base of grain; (*ff*) lines representing the position of the paleæ, which are seen in their natural condition in fig. 3; (*g*) the pedicel or receptacle to which the grain is attached.

Fig. 2 shows the ripe grain of rye, twice magnified; (*a*) embryo; (*b*) crown of hairs; (*c c*) shrivelled stigmas; (*d*) albumen, composing body of the grain; (*g*) pedicel.

Fig. 3 shows ripe grain in its natural position between the paleæ (*ff*).

Fig. 4 is intended to give a representation of the commencement of the formation of the ergot; but an accurate idea cannot be well given, on account of the minuteness of the particles and filaments composing the fungus: (*a*) is the ovary of the grain overrun with the fungus, which completely hides it from the view; (*b*) shows the fungus has cemented the anthers and the stigmas together; (*ee*) the two scales at its base, separated from each other to show the extent of the fungus, which stops generally at the receptacle (*g*), all these parts being twice or three times larger than natural.

Fig. 5. The ergot about half grown as it begins to show itself between the paleæ; (*a*) ergot beginning to lose most of its filaments and sporidia, and beginning to appear purplish; (*e e*) scales at its base, that have been spread open; (*g*) receptacle; (*h*) remains of hairy crown and stigmas.

Fig. 6. Matured ergot, exhibiting the furrow and several cracks and fissures, and retaining (*ee*) the two scales, and (*g*) receptacle, not altered; (*h*) remains of stigmas and hairy crown, still adhering. This and the preceding figure are twice the natural size also.

Fig. 7. A portion of a transverse section, so thin as to be transparent, magnified 700 times, showing the irregular, cellular structure enclosing minute fatty particles.

Fig. 8 represents some of the sporidia, magnified 1000 times, and which contain different numbers of green granules; the first, however, having none. Phœbus' figure of these is precisely similar; but Philippar's very imperfect.

Fig. 9 is their germination, by emitting tubes containing granules similar to those of the sporidium producing them.

Fig. 10 is their germination by giving off minute buds which ultimately become sporidia, four or five adhering occasionally to each other, and lastly separating.

Fig. 11 represents the membrane of the sporidium laid open and increasing in size, developing green granules on various parts of its surface.

Fig. 12 shows the manner a sporidium is divided by a septum or septa, by the green granules extending themselves laterally; different states being observed in the present figure.

Figs. 13, 14, 15. Different stages of the same process.

Fig. 16. The fungus assuming a radiating form, and beginning to develope sporidia upon its branches.

Fig. 17. The fungus arrived at maturity, its centre showing a structure analagous to that seen in fig. 7, and its several branches loaded with sporidia. Figs. from 8 to 17 magnified 1000 times.

Fig. 18. The acarus which lives on the interior of the ergot, being about one-fourth the size of the cheese-mite; magnified 80 times.

ART. XIX.—RESEARCHES UPON SALICIN AND THE PRODUCTS DERIVED THEREFROM. By M. R. Piria.

Few chemical substances have received so little attention as salacin. Since its discovery by M. Leroux, MM. Pelouze and Jules Gay-Lussac have made known the results of the elementary analysis of this matter, and nearly at the same time Braconot verified some of its properties. I am not acquainted with any later researches.

The difficulty with which salacin enters into combination with other bodies, has been probably the cause of the neglect in which this body has remained until the commencement of these researches. In fact, bodies whose atomic weight may be de-

termined by means of very definite combinations, would be much more like to promise important results from their study.

I had the good fortune, at the very commencement, to combine salacin with the oxide of lead. The analysis of this combination enabled me to establish the formula of salacin, both in a free state or when combined. This first step encouraged me to pursue my researches upon this, as I then supposed, sterile subject, but which I soon found to be very fruitful in new and interesting results. I do not flatter myself that these labors have completed the study of salacin; on the contrary, the subject is far from being exhausted. The long and expensive process which I employed to procure the hyduret of salicyle, the substance by means of which the interesting compounds, the objects of these researches, were obtained, prevented me from obtaining a large quantity of the products, and thus I was unable to make the study of each as complete as I would have desired. I nevertheless hope at some future time to fill up the deficiencies of the present paper.

I cannot, without being deficient in gratitude, pass without acknowledgment, the kindness of M. Dumas, in allowing me the use of his laboratory, and aiding me with his advice during these researches.

Salacin in a free state.

This matter is white, crystallized in plates, soluble in water and alcohol, insoluble in ether, fusible below 100°; it does not contain nitrogen, and does not loose water when exposed to a temperature of 200°—sulphuric acid communicates to it a beautiful and intense red color. The action which weak acids, oxidating bodies, chlorine, &c. exercise upon it, will be detailed in the course of this paper.

The elementary composition of salacin was determined by MM. Pelouze and J. Gay-Lussac. According to these chemists, it is composed of

Carbon,	55.49
Hydrogen,	6.38
Oxygen,	38.13
	100.00

The analyses which I have made accord as well as can be expected with those results. They result as follows:

	I.	II.	III.
Carbon,	55.68	55.04	55.54
Hydrogen,	6.36	6.39	6.43
Oxygen,	37.96	38.57	38.03
	100.00	100.00	100.00

This point established, I pass immediately to the products derived from the action of different bodies upon salacin, and in the first rank I place those substances which are always formed whenever salacin is submitted to the influence of an oxidadating body, under particular conditions. Their history is totally independent of that of salacin.

At the end of this paper I shall not fail to state some experiments, by the aid of which I believe that the formula and equivalent weight of salacin may be established.

The action of oxidating bodies.

The action which some oxidating bodies exercise upon salacin is, without doubt, the most remarkable which chemistry offers. The examination of the products of this reaction has led to very unexpected results.

We know from the experiments of Dœbereiner upon the production of formic acids, that salacin, as well as many other organic bodies, yields formic acid. When treated with peroxide of manganese and diluted sulphuric acid, I have also obtained the same result, but on using a mixture of bichromate of potassa and sulphuric acid as the oxidating agent, besides obtaining carbonic and formic acid, as in the preceding case, another very remarkable substance was produced, possessing very great

resemblance to the volatile oils. I shall call this body the hyduret of salicyle, to express the intimate analogy which exists between it and the oil of bitter almonds, which, according to the excellent researches of M. Liebeg and Woehler, most chemists agree to regard as a hyduret of a compound radical. We shall see that the hyduret of salicyle comports itself exactly in the same manner with a great number of bodies, and I have from this been led to consider its composition as analagous.

Salicyle.

It is by this name that I designate a body hitherto unknown in a free state, and which plays the part of a simple substance in its combination with different bodies. Like benzule, it forms very definite combinations with hydrogen, oxygen, chlorine, bromine, and likewise with the metals.

The formula for salicyle is, $C^{28}H^{10}O^{4}$, and its combinations are represented by one equivalent of salicyle united to one equivalent of another body.

Benzule being composed of $C^{28}H^{10}O^{2}$, it will be seen that these two substances do not differ, except in containing different proportions of oxygen. Salicyle might be considered as a deutoxide of benzule, or rather these two radicals, as different degrees of oxidation of a carburetted hydrogen, having the formula, $C^{28}H^{10}$.

In fact, M. Dumas, some years since, put forth an hypothesis, according to which benzule and benzoic acid were to be regarded as oxides of an hypothetical carburet of hydrogen, which he called benzogen. Salicyle and salicylic acid would be two other oxides of benzogen. Benzogen, on this hypothesis, consequently forms four different combinations with oxygen; and in this respect, it agrees with the less known simple bodies. The following would be the series of these oxidations:

$C^{28}H^{10}+O^{2}$, benzule.

$C^{28}H^{10}+O^{3}$, anhydrous benzoic acids.

$C^{28}H^{10}+O^{4}$, salicyle.

$C^{28}H^{10}+O^{5}$, anhydrous salicylic acid.

Hyduret of Salicyle.

The hyduret of salicyle, in its crude state, presents itself under the form of an oil, of a more or less intense red color; its agreeable and aromatic odor resembles a little that of the oil of bitter almonds; a simple distillation suffices to deprive it of color. The distilled oil is perfectly colorless; but if left in contact with the air, or even in bottles badly stopped, it again becomes red. In other respects, besides the color, its properties are not changed by the air; its taste is burning and aromatic, like the volatile oils.

Water dissolves a notable quantity, and the aqueous solution possesses the odor and taste of the oil itself. It has no action on litmus paper; put in contact with the salts of the peroxide of iron, it produces a very intense violet color. This color, when not in contact with the air, undergoes no change, but by the action of the air or of an acid, it becomes a dirty yellow. The salts of the peroxide of iron and of every other metal have no action on the aqueous solution of hyduret of salicyle.

Alcohol and ether dissolves the hyduret of salicyle in every proportion. Its density is 1.1731 at the temperature of 13°.5; it boils at 196°.5 c. under the pressure of 0 .760.

The hyduret of salicyle decomposes the alkaline carbonates even in the cold. By the aid of a bottle the decomposition is very manifest; the hyduret is soon dissolved, and the carbonic acid given off.

The caustic alkalies, when put in contact with the hyduret, enter into combination with it. The combination takes place with the disengagement of heat, and the compound which results separates from the alkaline liquid, if this be sufficiently strong.

Chlorine and bromine have a very powerful action on the hyduret of salicyle, accompanied with a great elevation of temperature and the disengagement of hydrochloric or hydrobromic acids. The whole substance is converted into chloride or bromide of salicyle.

Iodine is abundantly dissolved in hyduret of salicyle, without any action upon it, whether hot or cold. Concentrated ni-

tric acid attacks it strongly, and changes it at first into a yellow, azotated body, *nitrosalicide*, and afterwards into an acid which possesses the principal properties of carbazotic acid. The two products will be described separately.

The most advantageous method to obtain the hyduret of salicyle is the following:—Dissolve, in a suitable quantity of water, four parts of bichromate of potassa, and add to it three parts of concentrated sulphuric acid. On the other hand, prepare a tubulated retort, connected with a receiver, surrounded with cold water; introduce into the retort the quantity of salicin, on which the operation is to be performed, along with six times its weight of water, and apply heat. When the salicin is dissolved, and the solution has attained the boiling point, pour in through the tubulure, by small quantities at a time, the solution of bichromate of potassa and sulphuric acid. At each addition, a quick reaction will be manifest; the mixture assumes a green color, from the formation of sulphate of chromium, in a short time a milky water distils over, holding the hyduret of salicyle in suspension. By rest, the hyduret is deposited at the bottom of the receiver, from whence it may be withdrawn by means of a pipette.

Before entering into the details relative to the composition of the hyduret of salicyle and the compounds derived therefrom, I will dwell for a moment on the circumstances which accompany its production.

We cannot but be struck with the singular difference which is to be remarked between the products which salicin furnishes, under the influence of different oxidating bodies. As I have already said, when treated with sulphuric acid and peroxide of maganese, it yields only carbonic and formic acids. It is the same with a mixture of peroxide of lead and sulphuric acid; but when bichromate of potassa is substituted for the metallic peroxides, the products of the reaction are very different.

An attentive examination of the conditions under which the salicin is placed in these cases, naturally leads to the question, whether the presence or absence of a free acid could modify the nature of the resulting products. When we treat the sa-

licin by a solution of bichromate of potassa and sulphuric acid, all the elements of the reaction are dissolved in the same liquid, so that in proportion as the chromate of potassa is attacked, it yields potassa and oxide of chromium, which, in the quantities indicated, is in amount more than sufficient to neutralise the sulphuric acid. Hence, there is formed sulphate of potassa and sulphate of chromium, which cannot exercise any action upon the organic matters—and the oxygen, in a nascent state, can be regarded as the sole element concerned in the reaction. On the contrary, in the case where salicin is oxidated under the influence of metallic peroxides and sulphuric acid, we may conceive, that in consequence of the insolubility of the peroxides used, the reaction cannot be, so to speak, instantaneous, and the salicin is submitted, during the whole operation, to the simultaneous action of nascent oxygen and a free acid, which, as I shall have occasion to show, converts it into *saliretin* and sugar. The products of the decomposition of salicin becoming, in their turn, oxidated, give rise to carbonic and formic acids. Thus, we may explain this difference, by admitting that in the first case it is the salicin which is oxidated, and in the other the oxygen acts upon the salicin and the sugar.

The following are the experiments upon which I depend to sustain this conclusion:—1. The action which the free acids have upon salicin. 2. I am convinced that saliretin does not produce the least trace of hyduret of salicyle when treated by a solution of bichromate of potassa and sulphuric acid. 3. If we distil a mixture of salicin, bichromate of potassa, and sulphuric acid, as if to prepare the hyduret of salicyle, with the precaution to use more acid than is necessary to form neutral salts with the products of the decomposition of the bichromate, we hardly obtain any traces of hyduret of salicyle, and sometimes none at all; at the same time we may perceive the saliretin produced swimming on the liquid. From this period it is impossible to obtain the least quantity of product.

The hyduret of salicyle, as its name indicates, is such in composition as to be considered as a combination of one equivalent of salicyle with one equivalent of hydrogen. The com-

position of this being $C^{28}H^{10}O^4$, that of the hyduret will be $C^{28}H^{12}O^4$. I have made four analyses by combustion with the oxide of copper on perfectly anhydrous products. To obtain the hyduret in this state, I first rectified it over fused chloride of calcine for twenty-four hours. The oil having been poured off, was distilled, and when one half had passed over, the remainder was obtained separate. It was from this latter that the following results were obtained:

	I.	II.	III.	IV.
Carbon,	69.45	69.11	"	69.44
Hydrogen,	4.86	4.89	4.88	5.07
Oxygen,	25.69	26.00	"	25.49
	100.00	100.00	"	100.00

This, by calculation, would give:

C^{28}	1070.15	69.26
H^{12}	74.88	4.84
O^4	400.00	25.90
	1545.04	100.00

According to this, the hyduret of salicyle is isomeric with hydrated benzoic acid.

To ascertain whether, in the state of vapor, the two substances would exhibit a difference in condensation, I ascertained the density of the vapor by the process of M. Dumas. The results were as follows:

Excess of weight of globe full of vapor over same full of air,	$0^{gr}.421$
Volume of globe in cubic centimetres,	233

Temperature of vapor marked by a mercurial thermometer, 230° c. corresponding to 225 of an air thermometer:

Temperature of the atmosphere,	13°
Pressure,	$0^{m}.764$
Air remaining in the vapor,	0.0
Density of the vapor,	4.276

The density which M. M. Dumas and Mitscherlich each

separately obtained for the vapor of hydrated benzoic acid, is exactly the same as that which I found for the hyduret of salicyle. From this, each volume of the vapor of this latter should contain:

7 of the vapor of carbon,	=2.9512
3 " "	=0.2064
1 " "	=1.1026
1 " hyduret of salicyle,	=4.2602

the same as crystallized benzoic acid.

Chemistry exhibits few of such perfect cases of isomerism, where two substances, totally distinct, have at the same time a like elementary composition, and a similar condensation of their elements in the state of vapor. We shall likewise see that the combinations which result from the union of the hyduret of salicyle with bases, have the same composition as the corresponding benzoates considered as anhydrous.

According to the theory most generally received by chemists, benzoic acid is regarded as an oxide of a compound radical, benzule. This mode of considering the molecular arrangement of the element corresponds admirably with its reactions, and explains the remarkable stability of this substance, under the influence of the most active agents. The hyduret of salicyle, on the contrary, undergoes considerable alterations with many substances, whence result new compounds, of a very definite composition, and connected by simple relations with this hyduret.

This hyduret does not combine directly with other bodies. Chlorine, bromine, and the metallic oxides, by their action upon it, take away an equivalent of hydrogen, and an equivalent of chlorine, bromine, or metal, taking its place, is added to the other elements of the hyduret. There is consequently in the hyduret of salicyle an equivalent of hydrogen, which may be replaced by an equivalent of another body, and another part which always remains invariable, and which enters into numerous combinations. It is this latter which I regard as a compound radical, analogous to benzule, or rather to cyanogen, and which, to indicate its origin, I call *salicyle*.

The hyduret of salicyle should be a combination of salicyle with an equivalent of hydrogen, and have for its formula, $C^{28}H^{10}O^4+H^2$. This substance is a true hydracid of a compound radical, as hydrocyanic acid is, and metallic oxides act upon both in exactly the same manner. One equivalent of the hydrogen of the hyduret unites with the oxygen of the oxide, while the salicyle combines with the metal. Thus, we can perceive why the isomerism between benzoic acid and the hyduret of salicyle should be extended to their saline combinations; or in other words, why the anhydrous benzoates are isomeric with the correspondent metallic salicides, $C^{28}H^{10}O^3+MO$, being $+C^{28}H^{10}O^4+M$.

From these facts, it results that the hyduret of salicyle is to hydrated benzoic acid as the oxalic acid, $C^4O^4+H^2$, according to the views of M. Dulong, is to the same body as at present considered $C^4O^3H^2O$.

Metallic Salicides.

Salicide of Potassium.—This combination may be procured with great facility. It is sufficient to mix the hyduret of salicyle with a very concentrated solution of potassa, nearly 45° B. On stirring this mixture with a glass rod, the oil assumes the form of a crystalline mass, which separates from the excess of alkaline liquor. These crystals should be rapidly expressed between bibulous paper, and dissolved in a small quantity of hot alcohol. On cooling, the solution will deposit the salicide in square tables of great regularity.

The salicide of potassium is of a beautiful golden yellow color, greasy to the touch, very soluble in water and alcohol, and has an alkaline reaction. When very dry, it is not altered by the air; but in the moist state, it begins in a few moments with green and finally with black spots. This alteration soon extends to the whole mass, which finally becomes as black as soot. I shall soon have occasion to recur to the nature of this alteration.

Carbonic acid does not alter the salicide of potassium, either

in the dry or moist state. But the greater number of the other acids decompose it by setting force the hydrate of salicide. It is precipitated of a yellow color by the salts of lead, silver, protoxide and peroxide of mercury, manganese, baryta, &c.

The salicide of potassium contains a certain quantity of water of crystallization of which it cannot be deprived without partial decomposition. The water which is disengaged when the salicide is heated is always accompanied by a little of the hyduret of salicyle. This circumstance prevented me from determining exact its water of crystallization.

The salicide of potassium when anhydrous should be composed of one equivalent of salicyle and one equivalent of metal; in fact, by double decomposition it yields insoluble salicides, having this composition, and the remaining liquid is neutral to test paper.

Salicide of Ammonium.—On placing the hydrate of salicyle in contact with concentrated ammonia, the whole becomes a yellow crystalline mass soluble in water. On passing gaseous ammonia through it, the same phenomena results. In the latter case, the salicide of ammonium is presented under the form of yellow needles. This compound, both when in vacuo and in the open air, is rapidly destroyed. Ammonia is disengaged and the oil set free. On this account I was unable to ascertain its composition by direct analysis. But it may be deduced from the amount of ammoniacal gas which is absorbed by a known weight of the hyduret.

Salicide of Barium.—This salt is prepared by double decomposition with a solution of chloride of barium and a concentrated solution of salicide of potassium. The salicide of barium is precipitated as a crystalline powder of a beautiful yellow color. A process is to saturate a hot solution of baryta with hyduret of salicyle; the salicide of barium crystallizes on the cooling of the solution in yellow needles. It is but little soluble in water especially when cold.

I. 0.522 salicide of barium gave 0.292 of sulphate of baryta. On the other hand,

II. 0.650 of the same produced by combustion 0.200 of water and 0.898 of carbonic acid.

From these data this salt is composed of,

	Theory.	*Theory.*	*Analysis.*
C^{28}	1070.16	40.93	41.15 *
H^{14}	87.36	3.34	3.41
O^{6}	600.00	22.96	32.57
Ba	856.88	32.77	32.87
	2614.40	100.00	100.00

To agree with these results, the salicide of barium should contain two atoms of water of crystallization. To confirm this in a direct manner, I determined the amount of loss which the salt underwent by a heat of 160° in a current of dry air by means of the drying apparatus of M. Liebig.

1.237 of salicide of barium, dried in this manner, lost 0.110. This gives for the hundreth—

		Theory.	*Analysis.*
$C^{28}H^{10}O^{4}$+Ba=	2389.44	91.4	91.2
2Aq=	224.96	8.6	8.8
	2614.40	100.0	100.0

Salicide of Copper.—The best process for obtaining this, consists in agitating a solution of hyduret of salicyle to which recently precipitated hydrate of copper has been added. As soon as the hydrate of copper enters the solution, it changes to a beautiful grass green. This combination is to be thrown upon a filter, washed with alcohol and dried upon a salt water bath. In this state the salicide of copper appears under the form of a green powder, very light, of a slight cupreous and aromatic taste, insoluble in water and alcohol. When heated on platinum foil, in contact with the air, it gives off abundant white vapors, of which a part, condensing on the

* The quantity of carbon given by analysis was but 38.22, but we must add to this quantity that which is retained by the baryta as a carbonate. This latter is equal to 2.23, and the total of carbon will be 41.15.

cold portion of the matter, forms a crystalline sublimate in the form of very small plates with an iridiscent reflection.

The result of a first product gave—

I. 0.326 of the matter, 0.082 oxide of copper,

0.466 of the same gave 0.146 water and 0.939 carbonic acid.

A second product yielded—

II. 0.310 of the matter left 0.079 oxide of copper.

0.466 of the same gave 0.144 water and 0.925 carbonic acid.

These results give the following formula :

	Theory.		*Experiments.*	
			I.	II.
C^{28}	1070.16	55.50	55.75	54.94
H^{10}	62.40	3.24	347	3.42
O^{4}	400.00	20.74	20.70	21.30
Cu	395.70	20.52	20.08	20.34
	1928.26	100.00	100.00	100.00

Salicylic Acid, or Oxide of Salicyle.

The only mode by which I was able to procure this body was by heating the hyduret of salicyle with an excess of potassa. The mixture becomes at first of a reddish brown, but finally loses all color. In the meantime much hydrogen is disengaged, as happens with the hyduret of benzule when treated in the same manner. When the liberation of the hydrogen ceases, the heat is to be withdrawn and the mass dissolved in water, and hydrochloric acid added in slight excess. The salicylic acid precipitates in crystalline tufts, having every appearance of benzoic acid. On dissolving in hot water and cooling, it is obtained in white crystals.

The salicylic acid is slightly soluble in cold water, more so in hot, and very soluble in alcohol and ether. It is volatile without decomposition, and sublimes with great facility. In

this state it crystallizes in long needles, and much resembles sublimed benzoic acid.

It is slightly sweet to the taste, irritates the throat, strongly reddens litmus paper, and decomposes the alkaline carbonates with the disengagement of carbonic acid.

Concentrated sulphuric acid put in contact with salicylic acid, does not produce any change when cold; when heated, the mixture blackens and gives off sulphurous acid.

Concentrated nitric acid does not alter salicylic acid when cold, but as soon as heat is applied a rapid reaction takes place, accompanied with a copious disengagement of gas. At the commencement, the liquor is strongly colored yellow, but in a short time it becomes pale; evaporated to a syrupy consistence, it is almost without color. By, rest it deposits small yellow crystals of a very bitter taste. The color of the aqueous solution is deeper than that of the solid matter. This product of the action of nitric acid upon salicylic acid appears to be identical with that obtained by the same means from hyduret of salicyle. But of this I am not sure; the smallness in quantity of matter upon which I operated, prevented me from deciding this point.

Salicylic acid contains an atom of water, which it loses when it combines with bases. Its formula is $C^{28}H^{10}O^5+H^2O$. The following are the results of its analysis:

I. 0.307 of the crystallized acid gave 0.140 water and 0.678 carbonic acid.

II. 0.350 of the same gave 0.140 water and 0.775 carbonic acid.

Which is, in hundredths—

		Theory.	*Experiments.*	
			I.	II.
C^{28}	1070.16	61.32	61.16	61.27
H^{12}	74.88	4.29	4.41	4.43
O^6	600.00	34.39	34.43	34.33
	1745.04	100.00	100.00	100.00

I prepared the salicylate of silver by digesting the salicylic acid in an excess of a solution of ammonia, driving off the excess by boiling, and then precipitating with a neutral solution of nitrate of silver; the salicylate of silver falls down as a white insoluble powder. It was then separated, reduced to powder and dried on a salt water bath. The results of its analysis were:

0.420 of the salicylate gave 0.079 water and 0.530 carbonic acid.

0.307 of the same yielded 0.133 metallic silver.

These data give the following as its composition.

		Theory.	*Analysis.*
C^{28}	1070.16	34.70	34.91
H^{10}	62.40	2.02	2.09
O^{5}	500.00	16.22	16.43
AgO	1451.51	47.06	46.57
	3084.17	100.00	100.00

Alteration of Salicide of Potassium by the air, and of Melanic Acid.

I have already had occasion to say, that when salicide of potassium, slightly moist, is exposed to the air, it is promptly covered with spots, at first green, but finally black. At the end of a few days, the whole mass becomes black. If the experiment be made over mercury, in a jar filled with oxygen, the metal rises in proportion as the reaction goes on, and the oxygen is finally absorbed. When no oxygen is present, or when this gas and the matter are perfectly dry, there is not any alteration. To facilitate the action, it is necessary to moisten the mass occasionally with a few drops of water.

When the change is complete, the mass presents a carbonaceous appearance. By repeated washings with water, there is left a powder resembling soot. This powder is insipid, insoluble in water, very soluble in alcohol, ether, and the caustic alkalies. Acids precipitate it unchanged from its alkaline solutions. It decomposes the alkaline carbonates, liberating carbonic acid. Heated on platinum foil, it burns without

flame, and leaves no residue. I call this matter *melanic acid*, on account of its color. I prepared the melanate of silver in the same manner as the salicylate of silver. It fell down as a black, heavy powder. I preferred this salt for analysis, to ascertain the composition of melanic acid. It is as follows:

0.500 melanate of silver gave 0.088 water and 0.500 carbonic acid.

0.200 of the same left 0.096 silver.

The composition of melanate of silver, from this data, is:

		Theory.	
C^{20}	764.40	27.63	27.67
H^{8}	49.92	1.71	1.95
O^{5}	500.00	18.18	18.82
AgO	1451.61	52.48	51.56
	2765.93	100.00	100.00

The free acid gave from—

I. 0.350 acid, 0.127 water, and 0.722 carbonic acid.

II. 0.325 acid, 0.674 carbonic acid.

		Theory.	*Experiments.*	
			I.	II.
C^{20}	764.40	58.16	57.05	57.40
H_{8}	49.92	3.80	4.01	"
O^{5}	500.00	38.04	38.91	"
	1314.32	100.00	100.00	

To ascertain what had become of the other elements of the salicide of potassium, I examined the solution obtained by washing the carbonaceous mass with water.

It is perfectly neutral to test paper. It leaves on evaporation a white saline residue, which is deliquescent, and burns on platinum foil, yielding carbonate of potassa. It is not precipitated by the salts of lime or baryta, or by acetate of lead. The nitrate of silver and protonitrate of mercury occasion a white flocculent precipitate. These experiments indicate acetate of potassa. To obviate all uncertainty, I mixed a part

of this solution with a slight excess of sulphuric acid. The mixture was distilled to about four-fifths. The distilled liquid had a feeble odor of vinegar; to this, hydrate of baryta was added in excess, and the excess of baryta precipitated by a current of carbonic acid, and the liquid boiled for a few minutes, and then evaporated. There remained a saline mass, with all the characters of acetate of baryta. On treating this mass with strong sulphuric acid, abundant vapours of acetic acid were disengaged.

From the facts it results, that there is produced from salicide of potassium, by the action of the air, melanic acid and acetate of potassa, and since the quantity of acetic acid produced is just sufficient to neutralize the potassa, it follows that from each atom of salicide there is formed one atom of acetic acid. If to one atom of salicide of potassium we add three atoms of oxygen and the elements of two atoms of water, we will have an atom of melanic acid and an atom of acetate of potassa, as may be expressed by the following formula:

$$(C^{28}H^{10}O^{4}+K)+O^{3}+H^{4}O^{2}=C^{20}H^{8}O^{5}+(C^{8}H^{6}O^{3}+KO)$$

Chloride of Salicyle.

When chlorine is passed through hyduret of salicyle, in the cold, an active reaction takes place with the disengagement of hydrochloric acid. The liquid becomes hot and yellow, and on cooling, after the evolution of the acid gas has ceased, it assumes the form of a yellow crystalline mass. By dissolving this mass in alcohol, perfectly pure chloride of salicyle may be obtained in rectangular tables of pearly appearance.

This chloride is insoluble in water and the acids, but is soluble in alcohol, ethers and the fixed alkalies. This last solution is of a deep yellow, and acids precipitate the chloride from it, unaltered. In this respect it differs essentially from the chloride of benzule, which, under the same circumstances, is changed into benzoic acid. The chloride of salicyle is not altered by long boiling in a concentrated solution of potassa. Heated on a platinum foil, it fuses into a colorless liquid, and then volatilises. Its vapor burns with a flame edged with

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analogies between the compounds of salicyle and benzule led me to expect that a corresponding compound would be produced from salicyle and ammonia. But the study of this reaction led to unexpected results.

When a current of dry ammonia is passed upon dry chloride of salicyle, it is absorbed, and the chloride becomes yellow, and is in a short time changed into a yellow resinous mass—while water is condensed around the mouth of the tube through which the gas escapes. To render the reaction complete, the mass is to be powdered and submitted anew to ammonia. The yellow mass is then to be withdrawn and dissolved in alcohol, or better in hot anhydrous ether, from which it is deposited in fine crystals with iridised reflection. This I call *chlorosamide*. If before crystallization the mass be washed in cold water, the solution does not contain hydrochlorate of ammonia, and does not affect nitrate of silver. The unpurified and the crystals afford on analysis the same results. From this it results that the ammonia does not take chlorine from the chloride of salicyle, but since water is formed, oxygen is taken away. At first I attributed this to an error of observation arising from an incomplete drying of the materials—I then repeated the experiments with every precaution. The chloride was left in vacuo over sulphuric acid for twenty-four hours, and the ammonia was caused to pass through a long tube containing fragments of caustic potassa. The results were the same; water and chlorosamide were produced.

Chlorosamide is a yellow crystalline matter in small plates, insipid and nearly insoluble in water, which, however, becomes yellow when left in contact with it. It is soluble in alcohol and ether. Anhydrous alcohol does not alter it, but when diluted and hot, ammonia is liberated.

Chlorosamide also possesses the property of regenerating the matter from which it is formed, by appropriating the elements of water. To effect this it is only necessary to heat it in an acid or alkaline solution. When operating in a closed tube, there is in the first case produced a salt of ammonia, and the chloride of salicyle sublimes; in the latter, ammonia is

liberated, and the chloride combines with the alkali. On analysis of chlorosamide—

I. 0.532 of the matter gave 0.165 water, and 1.00 carbonic acid.

The nitrogen was ascertained by the process of M. Dumas.

I. 0.600 chlorosamide gave 33.5 centimetres of gas saturated with moisture at 15°, pressure $0^m.752$.

II. 0.600 gave 33. centimetres saturated at 15.5 pressure $0^m.751$.

For the chlorine—

I. 0.600 matter gave, 0.522 chloride of silver.

The formula best agreeing with these results is—

C^{28}	1070.16	56.52
H^{10}	62.4	3.30
O^2	200.00	10.57
$N^{4\text{-}3}$	118.00	6.23
Ch^2	442.65	23.38
	1893.21	100.00

Ammonia acts upon the bromide in an exactly similar manner, producing water and *bromosamide*, corresponding in composition with chlorosamide.

Salicin in combination.

I was not able to combine salicin either with acids, ammonia or the oxide of a number of metals ; the oxide of lead alone uniting with salicin.

To obtain this compound a few drops of ammonia were added to a hot solution of salicin, and then a solution of trisacetate of lead, which caused a copious precipitate; this addition was continued until one-half of the salicin was precipitated. This precipitate was then thrown on a filter and washed with boiling water. The salicinate of lead is a light white powder, both sweet and bitter to the taste. It is soluble in acetic acid and potassa. The acids decompose it readily, setting salicin free. Sulphuric acid produces a red color. It does not lose water when heated to 200°.

I determined the quantity of oxide in the salicinate of lead by the process of Berzelius, and burnt another part with oxide of copper. The results were—

	I.	II.	III.	IV.	V.
Carbon	60.57	60.16	60.02		
Hydrogen	5.68	5.93	5.88	5.08	5.07
Oxygen	33.75	33.91	34.10	"	"
	100.00	100.00	100.00		

I determined the quantity of oxide of lead on four different products:

	I.	II.	III.	IV.
Salicinate of lead	0.612	0.689	0.601	0.543
Oxide of lead	0.167	0.238	0.223	0.044
Metallic lead	0.205	0.187	0.148	0.272

From which data one hundred parts of salicinate contains:

	I.	II.	III.	IV.
Oxide of lead	63.36	63.40	63.03	62.06

As one hundred parts of anhydrous salicin contain 33.92 of oxygen, the proportion of the oxygen in the anhydrous salicin is to that in the oxide of lead, as 33.92 is to 12.25, or nearly 3 to 1.

If this be admitted as the true proportion, the formula for salcinate of lead would be $C^{14}H^{8}O^{3}+PbO$.

But the quantity of water replaced by the inorganic oxide would not be in a simple atomic ratio with the oxide of lead, therefore to avoid fractions of atoms it is necessary to consider the salicinate as a tribasic salt, having for its formula $C^{42}H^{24}O^{9}+{}^{3}PbO$. Then the formula of anhydrous salicin is $C^{42}H^{24}O^{9}$ and the crystallized salicin $H^{28}O^{11}$.

Action of Acids.

The action of acids upon salicin has been partially studied by Braconnot. This chemist found that when salicin was dissolved in hot water, acidulated with sulphuric acid, there was deposited on cooling, a matter which, from the form of its cry-

tals, he supposed to differ from salicin. I have examined this body and cannot detect any difference between it and salicin, sulphuric and nitric acids, the alkalies, &c., and analysis affords the same results as with crystals of salicin.

I may, however, remark that this substance is not always produced. I have seen salicin which when thus treated constantly yielded this modification, and some which as uniformly gave the common form of salicin.

Braconnot found, likewise, that concentrated sulphuric and hydrochloric acids changed salicin into a species of resin, which was deposited on the addition of water. I also find that many acids, even when dilute, effect this change, if heated to ebullition, the resin rising to the surface. It is sometimes white, but often slightly yellow, and has all the characters of that obtained by cold concentrated acid. I call this body *saliretin*. It varies in purity according to the purity of the salicin used; the more dilute the acid, the purer is the product obtained.

Saliretin is insoluble in water and ammonia, soluble in alcohol, ether, and concentrated acetic acid. Water precipitates it from these solutions. Potassa and soda dissolve it, but water does not throw it down, while acids, even the carbonic, precipitate it as a white gelatinous mass.

Concentrated sulphuric acid put in contact with saliretin becomes blood red. With strong nitric acid, it is, by boiling, changed into carbazotic acid.

The following analytic results are from a perfectly colorless product:

I. 0.504 saliretin, gave 0.264 water and 1.249 carbonic acid.
II. 0.309 " " 0.168 " and 0.776 " "
III. 0.380 " " 0.947 carbonic acid.

From another product the analytic results were—

IV. 0.369 saliretin gave 0.194 water and 0.973 carbonic acid.
V. 0.413 " " 0.214 " and 1.089 " "
VI. 0.349 " " 0.189 "

From which data the composition in hundredths would be—

	I.	II.	III.	IV.	V.	VI.
Carbon	68.57	68.59	68.09	72.96	72.95	
Hydrogen	5.80	6.02	"	5.83	5.75	6.00
Oxygen	25.63	25.29	"	21.21	21.30	
	100 00	100.00		100.00	100.00	

During the change of salicin into saliretin no gas is disengaged. Atmospheric air is not necessary for this change, for it takes place in an atmosphere of carbonic acid.

Saliretin being much richer in carbon than salicin is, we are tempted to suspect that the change is due to the withdrawal of the elements of water, but as the hydrogen is unchanged, and the oxygen is likewise less, this cannot be the case. From this consideration I was led to seek whether any other substance was at the same time produced. I saturated the acid liquor from which the saliretin had been separated, with recently precipitated carbonate of lead, filtered, and evaporated to dryness. Alcohol digested on this mass, and then evaporated on a salt water bath, left a transparent viscid matter of a sweet taste, soluble in every proportion, in alcohol, but not in ether. Nitric acid changed this into oxalic acid. Left to itself, at the end of two or three days the surface becomes covered with small round opaque spots. After a longer period, each of these becomes the centre of a mamillary crystallization, which finally extends to the whole mass. This substance, dissolved in water and mixed with yeast, undergoes the vinous fermentation. Heated with caustic alkalies, it becomes a deep brown. It results from these reactions that this matter is identical with sugar of grapes. To render this certain I subjected it to analysis with this result—

Carbon,	36.3
Hydrogen,	7.4
Oxygen,	56.3
	100.00

Action of Chlorine.

When a current of chlorine gas is caused to pass through water holding salacin in suspension, solution immediately

commences, and the liquid becomes more or less acid, and of an orange yellow; in time the liquid begins to be cloudy from the formation of a yellow crystalline matter. This substance, separated by the filter, washed and dried, appears in the form of yellow pearly microscopic crystals. It is but little soluble in water, and absolute alcohol; more so in dilute alcohol. Its odor is disagreeable and peculiar, its taste peppery and similar to its odor. Heated in a retort, it fuses into a yellow liquid, and then decomposes, and there distil over, water containing hydrochloric acid, and a colorless oil, leaving a residue of carbon.

This matter, burnt with oxide of copper, gave for—

I. 0.382 matter, 0.142 water, and 0.500 carbonic acid.
II. 0.500 " 0.200 " " 0.779 " "
III. 0.436 " 0.135 " " 0.765 " "

Also—

IV. 1,050 matter produced 0.965 fused chloride of silver.
V. 1.026 " " 0.968 " " "

This composition agrees with the formula—

C^{42}	1007.24	42.94
H^{24}	149.76	4.00
Cl^{4}	885.30	23.65
O^{11}	1100.00	29.41
	3742.30	100.00

Whence it results, that under the action of chlorine, salicin loses four atoms of hydrogen and gains four atoms of chlorine. If, while the current of chlorine is passing through the water containing salicin, this mixture is kept at the temperature of 60°, a red, oleaginous liquid is formed, and falls to the bottom. This new matter, when cold, has the consistence of turpentine, and an acrid, peppery taste; it is insoluble in water and the acids, but is soluble in alcohol, ether and the alkalies. This matter, previously perfectly dried, yielded on analysis from

I. 0.756 matter, 0.193 water, and 1.036 carbonic acid.
II. 0.640 " 0.153 " 0.888 " "
III. 0.530 " 0.798 chloride of silver.

These results agree very well with the formula—

C^{42}	1607.24	38.61
H^{17}	106.08	2.55
Cl^{7}	1549.27	37.22
O^{9}	900.00	21.62

This would seem to indicate that salicin is, during this reaction, deprived of water; and the anhydrous salicin, in its turn, loses seven atoms of hydrogen, which is replaced by seven atoms of chlorine.

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ART. XX.—ON THE PRESERVATION OF VINEGAR.

It is well known that vinegar cannot be preserved a long time, and that in a few weeks, especially in summer, the surface becomes covered with a thick mucus, and the liquid becomes cloudy; as this increases, the acidity lessens, and finally disappears.

There are at present four modes known by which this alteration may be prevented.

The first is to prepare a very acid vinegar; by this means, it is true, it may be preserved many years: but, as persons so seldom make their own vinegar, and for the most part provide themselves from that found in commerce, this mode would be useful only to a few individuals.

The second process consists in concentrating it by means of congelation. A hole being made in the crust of ice and the part not congealed placed in bottles. This operation is very certain; but, one-half of the vinegar at least is lost, although the crust of ice consists almost entirely of water; economical persons would not willingly use this method.

The third process is to withdraw the vinegar from all access of air, by means of flasks or bottles well corked and always

completely filled. Vinegar may be preserved a long time in this manner ; nevertheless this is not much used, because perhaps, when a portion is taken out the remainder is liable to spoil unless the bottle be refilled, for the empty part being filled with air, the vinegar soon becomes thick and tasteless.

The fourth process to preserve vinegar is by distillation ; it may thus be preserved many years unaltered by the action of either heat or air. But, as this is dear, it does not seem that many would adopt this mode, especially when the following is known, which is the most easy of all.

It is sufficient to place vinegar in a well tinned copper, and boil it rapidly for a quarter of a minute, and afterwards carefully bottle it. If any should suppose that the tinned vessel is dangerous for the health, they can put the vinegar in one or more bottles, and place these bottles in a boiler full of water, and thus expose them to heat over a fire. When the water has boiled for a few moments, the bottles are to be withdrawn.

Vinegar thus prepared may be kept for many years without losing its transparency, or spoiling, either by the free access of air, or in bottles only half full ; it may advantageously take the place of common vinegar with pharmaceutists in the formation of compound vinegars, as these soon become cloudy, and consequently lose all their acidity, at least when not prepared from distilled vinegar.

Note.—I prepared in the year 1786 a vessel filled with very weak cider vinegar, to which I had added two ounces of alcohol of 22° Beaume. This vinegar which was at first very weak, was not only preserved, but became as strong as the best Orleans vinegar, and retained its clearness for many years without spoiling, although the neck of the vessel was closed with a simple cone of paper. This vinegar was still in existence when I quitted the college of France, on the occurrence of the revolution.

Journ. de Chim. Med.

ART. XXI.—CASE OF POISONING BY GIN.

March the 17th, 1839.—A lad, of between seven and eight years of age, obtained access to a bottle containing some gin. In about twenty-five minutes after, he appeared to be slightly affected. He was left alone for a space of about five minutes, at the end of which time he was found lying on the floor insensible, with his nose bleeding. He was in such a position as to leave no doubt that he had fallen from a chair near the cupboard, in which was the gin-bottle. The chair did not stand there when he was left alone, and he must have placed it there.

The lad, very soon after he was found, threw some fluid from his stomach, which, according to the statement of his father, smelled of gin. He was put into bed and kept warm, but no medical treatment was adopted.

At 1 o'clock, P. M., (five hours after the spirit was taken,) a medical man saw him. At this time, according to the father's account, the tongue appeared to swell, the child groaned and seemed dreadfully oppressed. The quantity of gin that he had taken was computed at half a pint. An emetic was given, and the child was put into a warm bath, but neither produced any visible effect.

At 3, P. M., (seven hours after the spirit had been taken,) he was conveyed to the Charing-Cross Hospital, where he became my patient, and was seen by me about fifteen minutes after his arrival; in the interim, warm water had been passed into the stomach, and withdrawn by means of the stomach-pump. The fluid had not the odor of gin, nor of any thing peculiar, neither was there the odor of gin in the breath.

The lad was perfectly insensible and motionless; the limbs relaxed and powerless; the face pale; the general surface pallid, and below the ordinary temperature; the pulse very small, feeble, and 144; pupils contracted; the exclusion of light by the hand did not produce dilatation; the breathing was rather slow, difficult, and decidedly stertorous; there was involuntary urging of the stomach, by which a small quantity of fluid and saliva drained from the mouth; this had no peculiar odor. The

bowels had not acted. Whether urine had passed was not known.

The child's general appearance conveyed the idea that he was sinking rapidly, except that the countenance was peculiarly placid, and free from the expression in persons in *articulo mortis*; indeed the face did not correspond with the general symptoms, but formed a striking contrast to them.

He had three leeches applied to each temple, a purgative dose of calomel, a cathartic enema, an application of liquor ammonia to the scalp, a blister behind each ear, and mustard cataplasms to the feet: he had also a mixture of ammonia and camphor. He was placed with his head and thorax raised on pillows.

11, P. M., (fifteen hours after the spirit was taken.) The bowels have been opened, and urine passed, both without consciousness. The scalp red and slightly vesicated; the feet also red from the mustard cataplasm; the leech bites bled moderately; general appearance the same; the breathing still stertorous, but with the addition of mucous rale in the thorax; the irides still contracted; the eyes showing no signs of sensibility, the limbs still motionless and powerless; the skin prone to be cold; nothing elicited signs of consciousness; the pulse rather improved in strength, and still 144; the countenance still free from expression of anxiety, or uneasiness of any kind. The mixture to be continued; the body and extremities to be kept warm; the irritation of the scalp to be encouraged; and the elevated position of the head to be continued.

18th.—Half past 12, P. M., (twenty-eight hours after taking the spirit.)—The general appearance improved; the eyes occasionally opened, the pupils still contracted; no expression in the eyes of consciousness; the face and general surface still pale, and prone to be cold; the expression of the face still calm, free from anxiety, and peculiarly placid; the paleness of the face not of a livid character; the stertor of breathing diminished, but the effusion in the air-vessels of the lungs increased; the mucous rale increased, and extremely audible over the whole chest; the limbs still relaxed; the pulse still

small and rapid. The treatment to be continued, with light nourishment and coffee.

Half past 10, P. M., (38½ hours after taking the spirit.)—The eyes open, still better; the pupils less contracted; the irides more mobile. There is a look almost of consciousness; face and general appearance as at the last visit; the stertor still less; the mucous rale not diminished; pulse rather firmer, still quick, 144.

19th.—Half past 12, P. M., (52½ hours after taking the spirit.) The general appearance at first sight much improved; the eyes open quite well. The lad looks about him with seeming intelligence; and although he does not reply when spoken to, his declining to answer appears to be rather from disinclination than from incapability. The symptoms of coma have subsided in a very marked degree; the stertor still less than yesterday, and reduced to almost nothing; the lungs, however, appear to be even more loaded; the mucous rale extremely loud and general; the breathing rather shorter; cheeks rather flushed; skin generally hot and dry; pulse much more rapid from 160 to 180, but still distinct. He continues to take his medicine, and occasionally some tea and arrow-root. Limbs still relaxed and powerless; shows no sign of volition. In this the contrast is very striking between the seeming intelligence of his look and the inactive state of his will. He does not make the least effort, although he looks as if he could do so without difficulty. Has passed motions and urine since last night, both involuntarily.

4½, P. M. (57½ hours after taking the spirit.)—In nearly the same state as at last visit, except that the cerebral symptoms are diminished, and those connected with the respiration are increased, the lips slightly livid, respiration labored. The mucous rale still more intense, and may be heard by bringing the ear near the chest without contact of the ear or aid of the stethoscope.

To have a blister between the shoulders; rubefacients on the anterior part of the thorax; to continue arrow-root, &c.

March 20th, 3½, A. M. (67½ hours after the spirit,) he died.

Through the whole period there was neither delirium, injection of the conjunctiva, convulsion (or tendency to convulsion,) peevishness, or even anxiety of countenance.

Post-mortem appearances, about twelve hours after death.

External appearances.—The scalp free from any appearances of injury. The surface of the body perfectly natural, and without discoloration. No appearance of injury any where. Expression of face placid.

Head.—On removing the scalp, no unusual redness discovered on its inner surface, nor any on the pericranium.

The dura-mater rather more tense than usual; the arteries more visible; the blood within them rather more florid; in other respects natural.

No morbid adhesions between the dura-mater and the arachnoid. No escape of fluid.

The tunica arachnoidea more than commonly vascular. No coagulable lymph or other product of inflammation. Very slight pearly appearances, but not enough to indicate that inflammation had taken place.

The veins of the membranes distended with dark blood; those corresponding with the temporal regions especially. The veins on the anterior part of the membrane full, as well as those of the other parts; the fulness, therefore, not the effect of gravitation after death.

Base of the Cranium.—On removing the brain, a very small quantity of fluid (serum, tinged with blood,) in the fossæ of the base of the cranium; the quantity so small as to appear to be only what oozed from the vessels during the removal of the cerebellum: it appeared to accumulate during the process, the quantity not exceeding from two to three drachms.

The under surface of the brain natural. Upon making sections of the medullary substance, not more than the usual points of blood, nor indeed more than might consist of a healthy and vigorous state of brain in a child of the patient's age.

The quantity of fluid in the lateral ventricle natural; the vessels rather fuller; the blood within them more florid; the plexus choroides more than commonly full and florid; neither

coagulable lymph, turbid fluid, nor other sufficient sign of inflammation; the left lateral ventricle in every respect like the right; the other parts of the brain, including the cerebellum, healthy in appearance. No odor of gin, or any peculiar odor, in any part of the brain.

Chest.—No effusion or other sign of disease in the cavity of the pleura. The lungs on the parts first presented to view natural; the posterior and under parts dark and congested; the congestion probably commenced prior to death, and increased after from gravitation. There was no disease of the parenchyma. The trachea and bronchial tubes full of frothy, turbid fluid; the lining membrane of the air-passages natural, with the exception of a slight blush at the upper part of the trachea, so slight, however, as not to warrant any inference. The heart quite healthy; contained a small quantity of dark, coagulated blood, with some coagulated lymph Scarcely a drachm of fluid in the pericardium: this was healthy.

Abdomen.—Neither serum, pus, nor coagulable lymph, in the abdominal cavity. The stomach empty; its outer surface rather paler than usual; no remarkable vascularity of any part; the inner surface uniformly pale, and free from patches or discoloration, except a portion about the size of a child's hand, near the cardiac orifice, with very small vessels visible in and under the mucous coat; the form aborescent; color florid; this appearance, however, only such as is commonly seen, and such as may be the consequence of abstinence, or of the irritation of food; nothing beyond the vascularity of the part that resembled inflammation; the stomach in every other part healthy. The liver healthy. The gall bladder full and distended; the contents natural. Spleen and kidneys healthy. The intestinal canal natural; some parts more vascular and of deeper color than the rest, but still presenting nothing that is not commonly found in most subjects.

Surfaces of the viscera.—On all the surfaces a tendency to dryness. Those of the brain, the lungs, the heart, and the intestines, becoming so dry immediately on exposure to the air, as not to communicate the least moisture to the finger.

London Med. Gaz.

ART. XXI.—DETECTION OF ADULTERATION IN CHOCOLATE.

Some have asserted that the addition of fecula in the chocolate of commerce cannot be detected by reagents; basing their opinion upon the assertion of M. Dalh, professor in the University of Kœnigsberg, that 100 parts of cocoa contain 10.91 of amidine or fecula; but it has been proved by the researches of M. Delcher, pharmaceutist of Castillon, that cocoa does not contain an amilaceous principle.

A commission appointed by the Board of Health of Paris have made some experiments upon this point, and it results from their trials that the most easy mode of ascertaining whether chocolate contains farina or fecula, consists in treating four grammes of chocolate by 250 grammes of boiling water, filtering the liquid, and adding to the clear liquor an alcoholic tincture of iodine; this tincture will give a yellowish brown color with the decoction obtained from chocolate without fecula, whilst it will afford a blue color, more or less deep, according to the quantity of fecula present.

The members of the commission caused to be prepared by a manufacturer six specimens of chocolate.

The 1st.	contained in each pound	16	gram. of fecula
" 2d.		16	" of farina
" 3d.		32	" of fecula
" 4th.		32	" of farina
" 5th.		64	" of fecula
" 6th.		64	" of farina

They experimented upon these specimens, and distinguished that the blue color obtained by the tincture of iodine in the decoctions from the two first, was modified in that which contained fecula by the yellowish brown color of the chocolate, which did not happen in that containing farina; that from the the other four, an intense blue color was obtained, but more intense in the fifth and sixth specimens.

Chocolate fully ground, presents, when placed in the moulds, in winter, a clean and brilliant fracture; on the contrary, in summer, the fracture, under the same circumstances, is uneven

and whitish. This change in the fracture does not indicate any impurity in the chocolate, but is owing to the temperature which causes an alteration in the arrangement of the particles. We may be convinced of this fact by taking a portion with a rough fracture, exposing it to a temperature sufficient to render it soft, placing it in a mould, and, when partially hardened, submitting it to a low temperature ; it will be found, when perfectly cold, to present a smooth and shining fracture.

A. CHEVALIER.—*Journ. de Chim. Med.*

ART. XXII.—BI-MECONATE OF MORPHIA. By P. SQUIRE, Esq.

Mr. P. SQUIRE, impressed with the idea that the combination of the active principle of opium, as prepared by Nature, would prove more beneficial as a therapeutic agent than the artificial salts, instituted a number of experiments, with the view of procuring the bi-meconate of morphia as free of the other ingredients of opium as possible. He has at length succeeded in obtaining a tolerably pure salt, which, from the trials which have been made of it, has fully answered his expectations, as to its superior medicinal power over the other preparations of opium. This salt is given in solution, made nearly of the strength of the common laudanum.

Dr. Macleod, who, at the request of Mr. Squire, made trial of this salt, in his letter to that gentleman thus expresses himself : " It appears to me a very mild and efficient preparation, rarely producing headach or other discomfort. It has repeatedly answered, in the most satisfactory manner, where opium had disagreed, and has succeeded in some cases where the other salts of morphia (the acetate and hydrochlorate) had failed to give relief.

Mr. Henry Brandon details, in a letter to Mr. Squire, his own case, in which the superiority of this preparation is evidenced. He says, " I have been a martyr to a spasmodic affec-

tion of the muscles for upwards of fourteen years, and was obliged, after trying every other means in vain to have recourse to opium. I have taken crude opium, laudanum, the aqueous extract of opium, black-drop, *liquor opii sedativus*, and the acetate of morphia, and I declare that not one of them has succeeded so well as the meconate of morphia, which relieves much sooner, and without disturbing the stomach, leaving the system altogether in a more natural state of repose.

Dr. A. T. Thomson in a letter to Mr. Squire, speaks also very highly of this salt of morphia. He says, "I have given a fair trial of your new preparation of opium, the bi-meconate of morphia, which, when separated from many of the other constituents of opium, undoubtedly possesses anodyne properties superior to any of the other salts of morphia in ordinary use."—"I have administered it in three cases in private practice, well calculated to illustrate its properties.

"The first was a neuralgic pain of the left side of the face, extending from the temple to the molar teeth of the upper jaw. It remitted during the day, but returned with frightful severity during the night." Calomel and extract of opium, hydrochlorate and acetate of morphia, black drop, belladonna, extract and tincture of hyoscyamus, extract of aconite, disulphate of quinia, and arsenical solution, were all successively tried without relief. "The strength of the patient was nearly worn out for want of sleep, and under these circumstances your solution was prescribed. Thirty minims were prescribed in a fluid ounce and half of camphor mixture at bed-time. Two hours' sound sleep was procured, and, on awaking, the patient felt the most satisfactory abatement of her sufferings. She was ordered to continue it in doses of eight minims, in combination with fifteen minims of the arsenical solution, every third hour during the day, and to repeat the full dose of thirty minims at bed-time; whilst at the same time the bowels were kept moderately lax. The most gratifying results followed this plan of proceeding; the pain gradually yielded; in less than a week she had comfortable nights, after which the dose of the solution was rapidly diminished, its use discontinued during

the day, and on the third week I had the satisfaction of leaving her perfectly free from complaint.

"The second case was one of wakefulness without any apparent cause. All the usual preparations of opium had been tried without much benefit, and with suffering from headach and nausea on the mornings following the nights on which the narcotics had been given. The solution of the bi-meconate of morphia was given in doses of twenty minims; it effectually procured sleep, and was not productive of the morning distress which had supervened on the use of the other preparations of opium.

"The third case was one of anomalous pain of the hip extending down the thigh, which recurred three or four times in twenty-four hours. The patient had been frequently attacked with rheumatism: and conceiving it to be connected with that disease, the part was cupped, and the guaiacum mixture with small doses of blue pill was prescribed. Little benefit resulted until a week afterwards, when I ordered the part to be blistered, and the denuded part to be dressed with a piece of lint dipped in your solution thrice a-day. The pain rapidly abated, and on the fourth day it was completely gone.

"From the limited experience which I have had of the use of the solution, I am of the opinion that it possesses decided anodyne properties and stimulates less than opium or its tincture; and is much more certain in its influence than any of the artificial salts or other preparations of the day."

London Med. Gaz., March 9th, 1839.

NECROLOGY.

Bernard Courtois, the discoverer of iodine, died at Paris the 27th of September, 1838, leaving his widow without fortune. If, on making this discovery, Courtois had taken out a certificate of invention, he would have realized a large estate.

Journ. de Chim. Med.

MISCELLANY.

Adulteration of Drugs.—Professor Thomson, in his examination before the Medical Poor Inquiry Committee, stated that the trader sorts the drugs; the purest kind he sells in its natural state, the second kind he reserves for powders, and the worst of all he uses for tinctures, and this inferior kind is very often in a state of decomposition. Frauds are often practised in the drug market. Opium often contains a piece of iron imbedded in it; calomel often consists of a very little more than sulphate of barytes, which is an inert substance; and white precipitate of mercury is sometimes sold as calomel; but in scammony the adulteration is even more remarkable, an immense quantity of chalk being found in it, so that the active ingredient in it often varies from 8½ per cent. to 81¼ per cent. Gamboge is often a manufactured article; milk of sulphur commonly contains one-half of stucco, as is proved by exposing the composition to heat. Peruvian bark, as it comes from the hands of the drug grinder, consists of charcoal, with Venitian red, Carthagenian bark, lignum vitæ, and satin wood. Even so late as forty years ago, this composition was made by the Apothecary's Company, and was supplied to the army as Peruvian bark. It is known that on one occasion two chests of the genuine article having been sent to a drug grinder, he put eighteen chests of extraneous matter to the two of pure bark, and sold the remaining eighteen chests to his own profit. Calamine, or carbonate of zinc, as it occurs in commerce, contains very little of zinc at all, consisting principally of sulphate of barytes, colored with a little iron. Ginger is adulterated with 50 per cent. of capsicums, saw-dust, satin-wood, and flour, and sometimes the article sold does not contain more than 30 per cent. of ginger. Jalap is frequently adulterated with 28 pounds of barley meal per cwt., and lignum vitæ dust is sometimes used. Liquorice powder is made of equal parts of common sugar and barley meal, with a little turmeric. Lac and plumbago are adulterated with coal, and opium with an extract of senna, and there is sometimes an infusion of from 30 to 60 per cent. of water. Rhubarb is often made of 14 pounds of flour 8 ounces of turmeric, and 98 pounds of rhubarb; and the article sold often contains no more than one-half of its weight of rhubarb. Nitrate of silver, which is extensively used in medicine, is often adulterated with nitrate of lead. Tinctures are diluted with water. A gentleman, now retired from the

drug trade, was offered any powder he chose for 36s. per cwt., and when the person making the offer was asked if the article was genuine, his answer was, that it was the best he could make at the price, thus showing that the powder might be brought down to almost any price! The druggist himself sometimes sends out the genuine article to the grinder, mixed with a number of foreign ingredients; the grinder, then does his share of the adulteration—so that very little of the genuine article ever reaches the customer! The apothecaries, who are supplied by the chemists, only consider themselves judges of the roots and drugs as they present themselves in the natural state; they do not pretend to be able to apply any chemical tests to the article. Drugs are likely to be procured in their genuine state where the apothecary employs a respectable druggist who grinds for himself. To the knowledge of witness, only two houses in London grind their own drugs. It was his opinion that drugs adulterated as described, were commonly sold to country practitioners, and he thought that the education prescribed to medical men was not calculated to direct their attention to chemistry sufficiently to enable them to detect such frauds. Inasmuch as price is one of the tests by which medicine is purchased, the poor are more liable than others to be supplied with bad remedies. A chemist had urged the witness himself to deal with him, saying, in reference to his prices, that he could supply him with drugs for paupers much cheaper.

Formula for the Internal Administration of Turpentine.

℞.	Olei terebinth.	ʒiss—ij.
	Magnesiæ carbonat.	ʒi.

Tere simul et adde

Aquæ menth. sat.	℥v.
Syrupi limon.	ʒij.
Spir. lavand. comp.	ʒij.

Misce. sumatur pars quarta ter die.

Schonidts Tahrbucher and Med. Chir. Review.

Useful Application to Chilblains.—The following application is strongly recommended to relieve this troublesome affection.

Take of Balsam of Fioraventi,	ʒij.
Solution of acetate of lead,	ʒiij.
Olive oil,	ʒiij.
Hydrochloric acid,	ʒi.

Shake them well together.

The affected parts are to be rubbed once or twice a day with this embrocation, and a piece of silk paper, moistened with it, should be kept constantly applied. The strength of the embrocation may be easily increased or diminished by varying the quantity of oil used in preparing it.

When the chilblain has become chapped and ulcerated, the embrocation is to be applied only to the surrounding skin, and the little wounds should be dressed with laudanized cerate, to which we may sometimes add with advantage a portion of tincture of benzoin.—*Bul. Gen. de Therapeut., et id.*

Case of Poisoning by Arsenious Acid successfully treated by the Hydrated Tritoxide of Iron, by Dr. Deville.—A young lady, in consequence of a disappointment in a love affair, determined to poison herself, and accordingly one night, a little before twelve o'clock, took (mixed in water) a considerable quantity of arsenic powder, which had been bought to destroy rats. The symptoms of poisoning commenced about one o'clock in the morning with vomiting, and she brought up part of the powder with some undigested food. Dr. Deville did not see her before four o'clock, A.M., when she had vomited several times, was suffering dreadful pain in the head and stomach, with burning heat in the throat, and seemed in a very dangerous state. She was immediately given a quantity of milk and linseed decoction, to encourage the vomiting and to assist the discharge of the poison; but this and other means failed to give any relief, and the symptoms became more urgent. Dr. Deville then determined to give hydrated tritoxide of iron; but as he had some difficulty in procuring this, it was half-past five before he returned to the patient. He immediately administered about half an ounce of the antidote by the mouth, and repeated his dose every quarter of an hour, so that by eight o'clock, A.M., she had taken more than half a pound of the iron. He then stopped, as the medicine had produced vomiting and purging, and the urgent symptoms seemed somewhat abated; twenty-five leeches were then applied on the epigastrium, with other general treatment, and the patient gradually recovered. In twelve days she was perfectly well. From a careful examination of the poison which remained in the glass, out of which she had taken it, and from knowing the quantity of the powder originally contained in the packet, Dr. Deville came to the conclusion that 56 grains of arsenious acid had been taken into the stomach, and remained there for above an hour; and though a considerable part (which was thrown away) might have been discharged by vomiting, still a larger quantity, he conceives, remained in the stomach.

[The preservation of the patient's life, in the opinion of Dr. Deville, was incontestibly owing to the hydrated tritoxide of iron; but the case is open to considerable objections, for the greater part or the whole of the poison might have been discharged with the vomited matters, which unfortunately were not preserved.]

Rev. Méd. Fran. et Etran. Sept. 1838.

Toxicological Experiments, with Preparations of Chromium, by Dr. Berndt.—I. *Experiments with bichromate of potash.* Exp. 1. Fifteen grains

of the salt, dissolved in 2 ounces of water, were given to a full-grown rabbit. Five minutes after the animal took food; in twenty minutes the respiration became irregular, and thirst supervened. It now received a second dose of 15 grains, which produced very anxious respiration, and, attempts, as it were, at vomiting, which were rendered abortive by the peculiar structure of its stomach. In about an hour and a quarter, the fore-feet were seized with trembling; in two hours the strength had sunk very much, and there was also incipient paralysis of the hind-feet. Death ensued in two hours and twenty minutes, with convulsions and evacuations of the fæces and urine. The body was examined two hours after death; the jaws were firmly closed; the cerebrum, cerebellum, and spinal marrow were gorged with blood, and somewhat softer than usual; the trachea and lungs were likewise gorged; the heart was flabby, and the right auricle was filled with fluid blood. The stomach was injected, its mucous membrane was partially destroyed, and its contents, when tested, showed the presence of chromium. The intestines were filled with mucus. The liver appeared softened.

Exp. II. A pigeon received 30 grains, made into a pill, with crumbs of bread, in doses of 10 grains, with an interval of half an hour between each dose. Soon after the last dose the animal became rigid, and made ineffectual attemps to vomit. It died in about four hours with slight convulsions. Its body was examined three hours after death; the body was rigid, the brain gorged with blood in a remarkable degree, and it, as well as the spinal cord, appeared softer than natural. The crop was injected, and contained nearly the whole of the pills as they had been swallowed; the stomach contained some chromium; the whole intestinal canal was reddened; the heart was flabby; and the lungs were gorged with blood.

Exp. III. A wound was made in the neck of a moderate-sized bitch, and 30 grains of the salt were introduced beneath the integument, and the wound was then stitched up. Frequent evacuations of the bowels and bladder followed in about a quarter of an hour, and immediately afterwards vomiting and trembling. At first the matter vomited consisted merely of the food; it then became mucous, and after some hours resembled the serum of blood. The usual reagents showed no indications of the presence of chromium. In eight hours the hind-feet were paralyzed, the fore-feet continued to tremble violently. The animal died in eleven hours. The body was examined ten hours after death; it was rigid, and had an unpleasant smell; the wound was dry, whitish, and contained a trace of the salt; the cerebrum, and cerebellum were gorged with blood, and, along with the medulla, much softened. The lungs were filled with blood, as was also the right side of the heart. The stomach and upper portion of the intestinal canal, and the bladder, were reddened, but their contents showed no trace of the presence of chromium.

[Sufficient care does not appear to have been here taken in testing for chromium. The metallic salts, it is known, are capable of forming definite compounds with animal and vegetable substances; and in such cases their presence cannot be detected by the usual reagents. It is necessary to destroy all traces of organic matter before any reliance can be placed upon the indications afforded by the reagents.]

Exp. iv. A dog, three months old, received 4 grains in half an ounce of water. In about half an hour vomiting ensued, and most of the solution was evacuated. The vomiting then ceased; the dog remained for some time very weak, but eventually recovered.

Exp. v. Three grains in powder were given to a frog. (In the experiments with frogs they were placed in water, but not deep enough to cover the head.) Vomiting ensued immediately, and part of the undissolved salt was evacuated; the vomiting, however, continued, and the animal died with convulsions in about an hour. The body was examined immediately; there was no rigidity; the brain and spinal cord were softened; the lungs were dilated and traversed by red vessels; the heart was flabby. The intestinal canal was not much injected, and the contents of the stomach showed the presence of chromium.

Exp. vi. A frog received 2 grains in pills. The consequences were similar to those of Exp. v.

Exp. vii. Five grains were dissolved in 4 oz. of water, and a frog was placed in the solution. In a quarter of an hour it became restless for a short time; in about an hour the restlessness returned, and continued to increase till, in about two hours, it attained its maximum. In eight hours spasms of the hind-feet came on with retching and vomiting. It died in about twelve hours, and the body was examined ten hours afterwards. It was very rigid; the heart was flabby, and like the lungs gorged with blood. The brain and spinal cord were not examined.

Exp. viii. A frog was placed in a solution containing 20 grains to 4 oz. of water. The phenomena were similar to those observed in the preceding case, but more violent, and death ensued in three hours and a half. The brain and spinal cord were very soft; the lungs small and dark colored, the heart filled with blood. The throat, stomach, and intestines were highly injected.

Exp. ix. A frog was placed in a solution containing 20 grains to 2 oz. of water. The results were similar to, but more violent than those of the two preceding cases.

Exp. x. A frog was kept for forty-five minutes in a solution containing 20 grains to 2 oz. of water. It was then taken out of the solution, washed, and placed in fresh water. The removal produced no change in the phenomena, and the animal died in four hours.

Exp. xi. A solution of 10 grains in 3 drachms of water were injected into the jugular vein of a dog four months old. The animal cried violently

and died instantly. The body was immediately opened: all the blood in the cavity of the thorax was found coagulated; the heart was very much dilated, and its right half continued to pulsate after the left had ceased. The blood in the brain was partially, in the abdomen not at all, coagulated.

II. *Experiments with the chromate of potash.* These experiments were conducted in a similar way to those already related; and the effects of the chromate resemble very nearly those of the bichromate. Perhaps the latter salt is fuliy more powerful than the former; but the details of the experiments are so much like those we have already given, that we think it needless to enter more fully upon them.

III. *Experiments with the protoxide of chromium.* These experiments merely prove that the protoxide is an inert powder.

IV. *Experiments with substances which it was conceived might prove to be antidotes.* These experiments consisted in first poisoning the animals with the chromate or bichromate of potash, and then giving carbonate of potash, sulphate of iron, or tincture of galls, as antidotes. These substances, however, did not in any way neutralize the effects of the poison, and we need not, therefore, detail the experiments.

Medicinische Zeitung. Nos. 24 and 25. 1838.

Granville's Lotion.—Each kind of lotion consists of three ingredients.

1st. *The strongest liquor of ammonia*, A;

2d. *Distilled spirit of rosemary*, B;

3d. *Spirit of camphor*, C.

Preliminary steps.—A. Saturate a given quantity of distilled water, contained in a glass receiver surrounded by ice, with ammoniacal gas, obtained in the usual way from the mixture of equal parts of hydrochlorate of ammonia and recently slaked lime, both reduced to a fine powder. The water may be made to take up nearly 800 times its bulk of ammoniated gas under the circumstances described; its specific gravity will then be about 872, and 100 parts of it will contain thirty-three parts of real ammonia, according to Sir H. Davy's tables. This solution of ammonia will, therefore, be more than three times the strength of the *liquor ammoniæ* of the Pharmacopœia of London, 100 parts of which, at a specific gravity of 960, contains only ten parts of real ammonia. I have, therefore, called mine "liquor ammoniæ fortissimus."

B. Take two pounds of the tips or small leaves of fresh rosemary, and eight pints of alcohol; leave the whole in infusion for twenty-four hours in a well covered vessel, and after adding a sufficient quantity of water as will just prevent the empyreumatic smell, distil over *seven* pints. The Pharmacopœia of London directs the essential oil of rosemary to be distilled instead with rectified spirit. Such a preparation I found unsuited for my purpose.

C. To four ounces of pure camphor add two pints of alcohol, so as to

dissolve the camphor, which solution should be filtered. The present *tincture of camphor* of the Pharmacopœia of London, contains one ounce more of that substance, and does not harmonize so well with my two other ingredients as the weaker preparation.

The three ingredients thus prepared, every medical man should keep always ready at hand, in well-stoppered glass bottles, so as to be able to make extemporaneously, a counter-irritating lotion of any requisite strength, according to the nature of the case requiring that application on extraordinary occasions. But for the ordinary purposes detailed in my work, it will be better to keep both a milder and a stronger ammoniated lotion ready prepared for use.

The milder Ammoniated Lotion.—Assuming the quantity of lotion desired to be divided into *eight* parts, then the proportions of the ingredients will stand thus:

A—four-eighths,
B—three-eighths,
C—one-eighth.

The stronger Ammoniated Lotion.—If the quantity desired be also divided into eight parts, then the proportions of the ingredients run as follow:—

A—five-eighths,
B—two-eighths,
C—one-eighth.

Although the changes of proportion here may be deemed trifling, yet the strength of the lotion is such, that I never employ it, except in cases of apoplexy, and for the purpose of cauterization.

Directions in mixing the Ingredients.—A and B are gradually mixed together. The mixture becomes opalescent and somewhat turbid, and a peculiar, highly agreeable, ethereal smell is given out, different from the individual odor of either ingredient, although the extreme pungency of the ammonia be still discernible. I have strong reasons to believe that, at this point of the operation, some particular change takes place, which imparts to the mixture of the two ingredients some of its valuable peculiarities as a counter-irritant, described in my work; but what that change is, it is not my business to enter upon in this place: suffice it to say, that in a great number of experiments, made with the ingredients separately, (for each of them acts as a counter-irritant on the skin,) and with them combined, the effects were uniformly different; those in the former case being found unequal to the production of those complete results which I trust I have justly promised to the profession. Ammonia alone (however strong) will not give rise to the effects I have described, though it has often stopped internal pain, and produced *small little blisters;* but never has it succeeded in almost immediately producing a full vesication, as I have seldom failed to produce with the two ingredients mixed together, particularly after the third ingredient has been added.

Before, however, that third ingredient is so added, it is desirable to clear the previous mixture by the addition of a small quantity of alcohol, and to set the whole in a cool place. All the various precautions here mentioned may, upon an emergency, be dispensed with, when an immediate action is required, either to arrest pain or relieve deep-seated inflammation. But for the more delicate uses, particularly for instantaneous vesication, the preparations should be obtained in the manner I have specified.

The lotion must always be kept in bottles with a glass stopper; and their whole virtue depends on the accurate distillation and preparation of the ingredients, as well as on the careful admixture of the latter. The species of ethereal principle formed during the admixture, remains present in the lotion, but it is apt to vanish if the bottle be frequently opened, and then much of the peculiar effect of the counter-irritation is impaired. It is one of the many recommendations of these powerful preparations, that their effluvia, besides being agreeable, are of precisely that nature which is most likely to revive and benefit the patients laboring under diseases that require the application of counter-irritants. The compound camphor liniment is the only known combination of ingredients nearly similar to the ammoniated lotion just described. But the profession is well aware that the liniment will not produce, and never has produced, the effects I have predicated.

Among those effects, one of the most surprising is that of giving rise, in a space of time varying only between three and ten minutes, and in almost every instance, (if such a result be the desired object,) to as ample and full a vesication as can be expected, in as many hours from the best Spanish flies. This is a result which I am not aware has been obtained before in so short a time, except by boiling water, (a remedy not quite so pleasant as the odor of ammonia;) and on it, therefore, as well as upon its importance in the treatment of many serious disorders, I do take my stand, as also upon that of arresting nervous and muscular pain, almost immediately, provided it does not depend on structural disease."

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